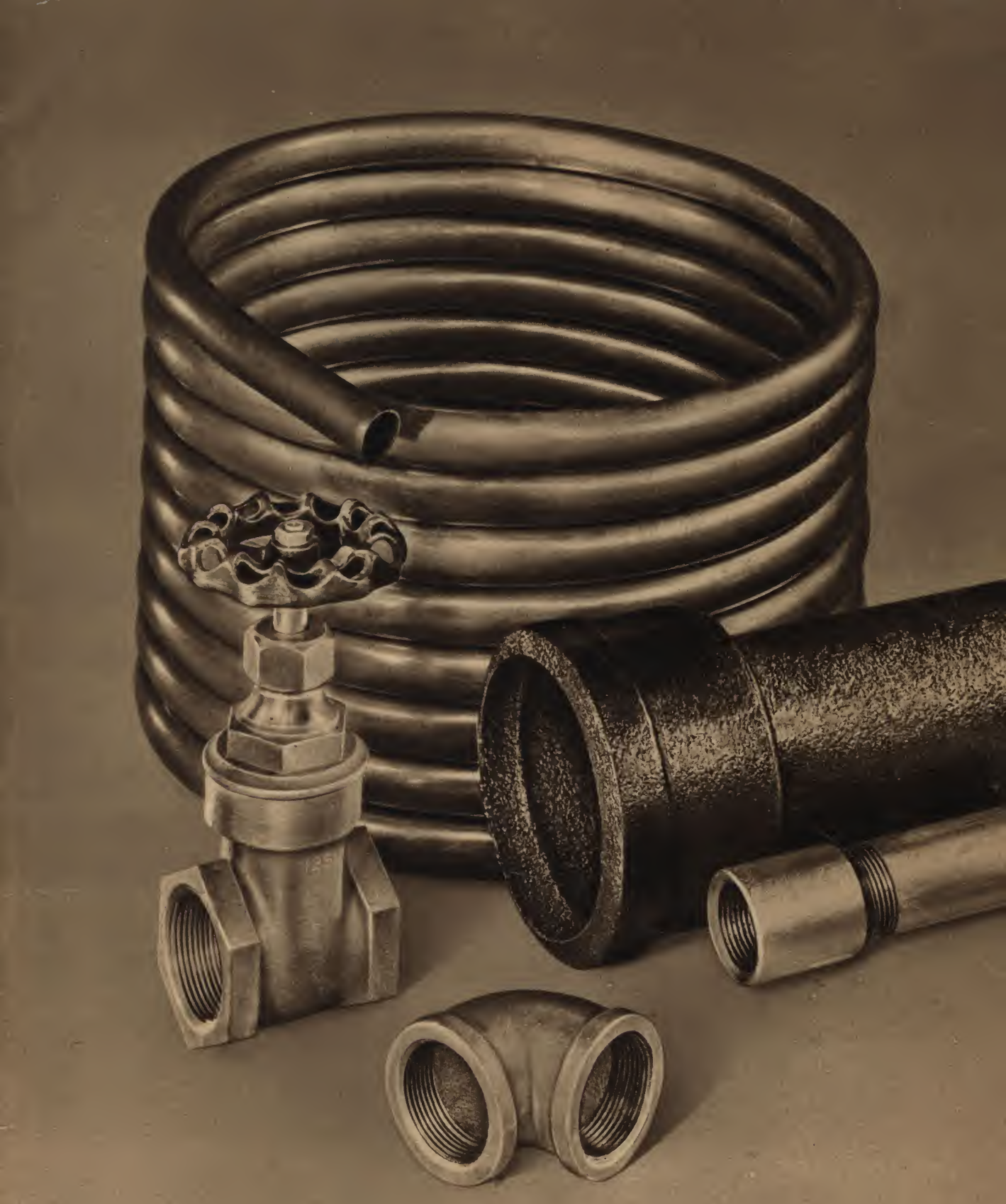


PLUMBING SIMPLIFIED

A Guide for Planning, Selecting and Installing

Montgomery Ward

Purposes of this booklet

Plumbing can be installed in any building having running water under adequate pressure, supplied through city mains or by individual system.

Plumbing for a small or medium size house is not complicated. However, like most worthwhile tasks it requires accurate planning and careful workmanship.

Many home owners have sufficient skill to install a satisfactory system. Some will feel they lack the skill or time to install their own plumbing. In such cases, skilled workmen should be hired. Others will want to do part of the work, hiring someone to help. The first purpose of this booklet is to help you decide just how much you will do yourself.

The second purpose of this booklet is to guide the actual planning and installation of plumbing. Simple terms explain water distribution to fixtures, waste and drain system, venting and sanitary sewage disposal. Clear illustrations show typical piping arrangements and connections. Individual fixture hook-ups and "how-to-do-it" operations are all included.

Pages 4 through 11 break down a typical plumbing system into each of its parts. The function of each is explained and shown. Water distribution pipes, fittings and valves are shown on Pages 4 and 5.

The drainage system for this same installation is shown on Pages 6, 7 and 10; the vent pipes on Pages 8 and 9. Actual piping arrangements differ in various installations, but basic principles are the same.

While most local and many state governments have "codes" or sets of rules for installing plumbing, modern plumbing largely consists of assembling high quality, standardized products. Methods in this book are based on sound plumbing principles and therefore meet most code requirements. However, slight differences may be necessary in your area. Get a copy of your local code from your city hall, or state or county plumbing board or health officer and read it carefully before planning installation.

It is suggested you first read this booklet through without too much attention to details, for an overall understanding. Then return to the beginning and follow the sections which apply to your problem as you plan your work step by step. Decide what fixtures you want; where they will be located. Prepare rough working sketches, showing principal parts of system, with measurements. Cross-ruled paper is handy for this. Make a list of all materials and tools. (See Back Cover for Wards Tool Loaning Service.) When you are ready to start actual work go back to Pages 22-25 for the order of work; list the principal parts of your job in order, and check them off as they are finished. Refer back to various pages for needed details as you proceed. For fixtures, etc., study also individual instructions received with them.

Should you have special problems requiring additional advice, write to Wards Engineering Service Department at your nearest Ward Mail Order House giving complete information. There is no charge.

Choose modern

Fixtures are the part of the plumbing system you see and use every day. Select them carefully.

In planning your plumbing system, start with the fixtures —using Wards large General Catalog as a helpful guide. Complete descriptions of fixture materials and construction are given. Sizes are stated so you can tell beforehand how they will fit in your room. Clear prices enable you to estimate the cost of the job. Any fixtures you may select and buy from Wards are fully guaranteed and can be bought on Wards convenient Monthly Payment Plan.

KITCHEN SINK. Available in many sizes and types. Cabinet sinks enjoy greatest popularity. Some are all steel construction; others have cast-iron tops mounted on steel cabinets. (A) above, is a typical 66-in. all steel, double basin cabinet sink with drainboard at each end. Large storage space in cabinet is divided into drawers and compartments for storing pots, pans, lids, cutlery, etc.

The 54-in. all steel sink (B) has a single basin and two drainboards. Smaller space may require a 42-in. sink (C) with single basin and drainboard. Wall hung sinks without cabinets are available as well as flat rim sink basins alone for mounting in home- or custom-built wood cabinets.

LAVATORY. May be hung from concealed wall brackets with or without supporting legs in front (D) or, may be independently supported by its own cabinet (E). Modern cabinet lavatories provide handy storage space for towels, wash cloths, soap, bottles, etc.

CABINET SHOWER. (F). Convenient and economical way to provide a shower in bathroom (with or without bathtub),

Illustrations in this book show typical installations. Each actual installation must be adapted to individual requirements and to applicable local codes and state laws.

FIXTURES FOR BEAUTY, COMFORT, VALUE

basement, utility room, garage or other location. Low-priced models are available for secondary facilities.

WATER CLOSET. Made in three standard types—syphon wash-down, reverse trap and syphon jet. All are similar in appearance to (G) but differ in flushing action. Syphon jet closet has fastest, quietest action—using a minimum of water.

BATHTUB. Either steel or cast iron, covered with hard, glass-like, fused-on porcelain enamel. Modern tubs are designed for "built-in" type of installation. They fit flush with wall and floor. Dirt and water cannot collect behind or under tub as with old leg style set away from wall.

Recess style tub fits into end of small bathroom or recess of larger bathroom so that it has a wall at back and at each end. Corner style (H) fits in corner of bathroom—requiring walls at back and one end only. Order tub with drain and overflow at either your left-hand or right-hand as you face the tub (they are not interchangeable). Faucet or faucet-shower combination mounts on wall at same end.

WATER HEATER. Hot water may be supplied from one of several types of automatic storage heaters or a hot water storage tank connected with an external water heater or furnace coil. Automatic storage heaters similar to (J) are available in various sizes. Common fuels used for automatic water heaters are: electricity; natural, manufactured or mixed gas piped through mains; bottled or tank gas; oil or kerosene. Non-automatic heaters burn gas, oil, coal or kerosene. Consult local companies for rates.

Proper size is based upon number of persons in household, amount of laundering done at home and whether members of household tend to use moderate or liberal amounts of hot water. Children 6 years and younger should be counted as two persons as they normally require more frequent bathing and have greater laundering needs. Homes with extra bath (shower or tub) tend to use more hot water. Large households may have to schedule bathing, etc. Hot water supply can be somewhat increased and fuel cost reduced by installing "tempering" tank (same as "range boiler" or tank used with external heater) *without* insulation, so water passes through it before entering water heater.

Suggested sizes for average hot water use are given in table below. If you feel that your family will use greater amounts of hot water than the average family, select next larger size. Larger size electric heater is needed because heating rate is somewhat slower, and so water may be heated and stored during hours when electricity rates are lowest.

Sizes shown in table are *storage* capacities.

Number of Persons in Household	Automatic Heaters		Water Tank with External Heater
	Electric	Gas	
2 to 3	30 gals.	20 gals.	30 gals.
3 to 5	50 gals.	30 gals.	30 gals.
5 to 6	66 gals.	40 gals.	40 gals.
6 to 7	80 gals.	40-50gals.	.....

WATER SOFTENER. (K). Will pay for itself in areas of hard water by saving soap, clothing wear and plumbing repairs. Learn grains of hardness from local water works or write to Wards for free water sample container and instructions.

LAUNDRY TUB. A large, sturdy laundry tub is useful in nearly every household. The tub shown (L) is fine-textured, smooth concrete of excellent durability.

THESE PIPES

House plumbing is made up of two major piping systems: I) *Distribution Pipes* which carry fresh water to sinks, closets, lavatories, bathtubs and other fixtures, II) *Waste, Drain and Soil Pipes* which receive the discharge from fixtures and carry wastes to the house sewer.

Water may be supplied by city mains (large pipes) or a private water system using a well or other water source. Modern automatic electric pumps give dependable water supply at pressures equal to city mains. Home plumbing is the same whether water is supplied by city mains or private system.

(For complete information on how to develop a private water system, write to your nearest Ward Mail Order House for free copy of booklet "Running Water for Farm and Country Home." Also see Wards large General Catalog for complete line of pumps, well equipment and accessories.)

Branch pipe from city main in street to house is called *House Service*. Consult water works about this pipe; also underground shut-off valve and water meter, if required.

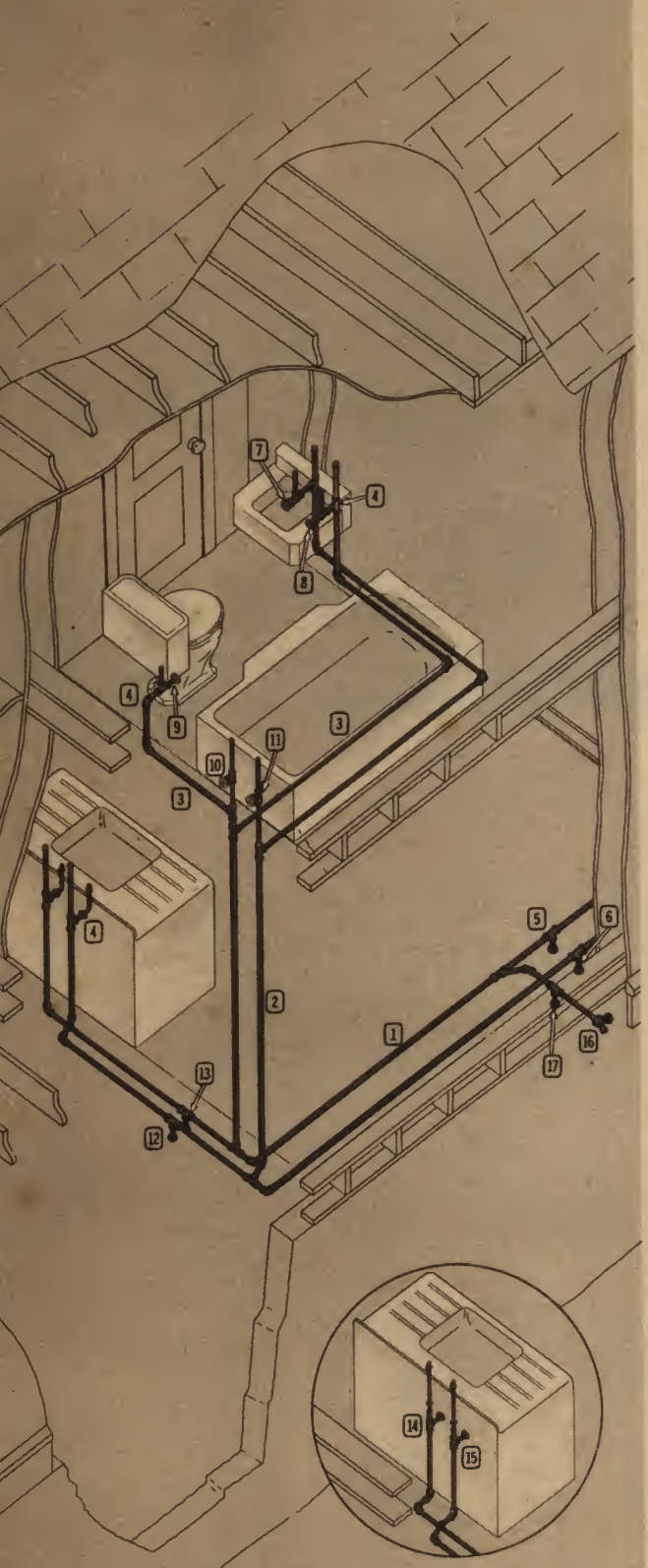
Within the house, water distribution system consists of *Basement Supply Mains* (1, Picture 1), *Risers* (2), *Fixture Branches* (3) and *Fixture Supply Pipes* (4).

Basement supply mains should be graded slightly down to one low point for easy draining. This may be at laundry tub or water pump—or any convenient point as (5) and (6) where stop and waste valves can be installed. Hot water basement main is often graded down to water heater for draining of hot water pipes. Grade horizontal supply pipes upstairs toward risers.

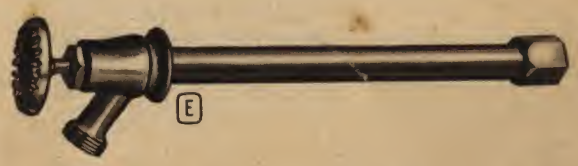
Basement pipes are usually suspended from ceiling and held in place by steel straps, wrought iron hangers or wire hooks. In houses without basement, supply pipes may run under floors, within walls or in attic. Wherever water pipes are in danger of freezing, as under floor (with no basement), or in outside walls, they should be covered with wool felt or other insulation.

Risers carry water to horizontal fixture branches upstairs. Fixture branches carry water to fixture supply pipes which, in turn, supply faucets. Risers, branches and fixture supplies are usually installed inside of partitions and under floors. When adding plumbing to an older home, they are sometimes run outside of partitions to avoid cutting and breaking plaster. All water pipes should be firmly supported by pipe straps.

Valves are used throughout piping system to control the flow of water. A gate type shut-off valve should be installed in pipe just beyond the pressure tank of a private pumping unit. If city supplies the water, install a gate type valve in house service pipe between water meter and foundation wall. This permits complete shut-off of house water supply. The cold water feed branch into the hot water tank should have a similar valve



PICTURE 1



CARRY FRESH WATER TO FIXTURES

to shut off hot water lines. Install close to hot water tank but not between tank and safety relief valve.

Best method of controlling water supply to bathroom fixtures is to use fixture supply pipes with shut-off valves (7), (8) and (9). Supply to bathtub is cut off by valves (10) and (11) reached through small wall panel in next room. This installation makes it possible to cut off supply at any bathroom fixture without disturbing other fixtures. Another, but less convenient method is to cut off supply to all bathroom fixtures at one time by installing shut-off valves in risers serving bathroom group.

Two stop valves (12) and (13) in basement stop supply to kitchen sink without disturbing second floor fixtures served by risers (2). These valves can be conveniently located under sink if supplies come up through floor instead of in wall (see inset). In this case, valves (14) and (15) replace valves (12) and (13) in basement. Water supply to sill faucet (16) is cut off by stop and waste valve (17).

Commonly used valves and water supply accessories are shown below. They include gate valve (A), stop valve (B), stop and waste valve (C), and sill faucet (D) and freeze-proof wall hydrant (E) for garden hose.

For water distribution within the house, use galvanized steel pipe with handy nipples (F), rigid copper tubing (G) or flexible copper tubing (H). Brass pipe is excellent but very expensive. Steel pipe is lowest priced. Copper has several advantages. It is smoother inside, giving better water flow, size for size. It is less corrosive and lasts longer. It is sometimes easier to install because of its light weight. Flexible type copper tubing is easily bent where change in direction is required, reducing the number of fittings needed and saving labor—ideal for modernization of old houses.

All pipe and fitting sizes are *inside* diam. See table below:

Pipe Size	Outside Circum.	Outside Diam.	Pipe Size	Outside Circum.	Outside Diam.
⅜ in.	2⅛ in.	11/16 in.	1¼ in.	5¼ in.	1 11/16 in.
½ in.	2⅝ in.	⅞ in.	1½ in.	6 in.	1 15/16 in.
¾ in.	3¼ in.	1 1/16 in.	2 in.	7½ in.	2 7/16 in.
1 in.	4⅛ in.	1⅜ in.	2½ in.	9 in.	2 15/16 in.

"Sweat" type fittings for copper tubing are soldered into position, for quick, tight joints. These include coupling (J), 90° elbow (K), regular or reducing tee (L) and union (M). Adapter fittings (N) and (P) are used to join copper tubing to threaded steel pipe, fittings or valves.

Use threaded galvanized fittings to assemble a steel pipe system. Such fittings include 90° elbow (R), 45° elbow (T) 90° street elbow (U), regular or reducing tee (V), coupling (W), reducer (X), union (Y), bushing (Z), plug (AA) and pipe cap (BB).

A union, consisting of two parts joined at center and sealed with built-in ground bronze seat (or gasket), is necessary at any point where connections cannot be made continuously.

Careful sizing of the water supply and distribution system is important. For most single family one- and two-story houses, ¾-in. (inside diameter) house service pipe is adequate. House service pipe smaller than ¾ in. should not be used.

Generally, basement supply mains are ¾-in. (inside diameter). Cold water main connects to house side of meter or water system pressure tank and distributes cold water to risers serving fixture groups or individual fixtures (see Picture 1). Hot water main should be same size as cold water main. Main and cold water feed branch to water heater should not be smaller than ¾ in. pipe size.

Where private water system furnishes water, install ¾-in. mains throughout. If more than one bathroom will be supplied by pump, 1-in. mains are advised. Cold water main connects directly to discharge opening of pressure tank instead of house meter as for city supply. Pressure in system depends upon pressure settings of pump switch. As a rule this is 20 lbs. minimum and 40 lbs. maximum.

Riser pipes are of ½- or ¾-in. inside diameter. Where risers supply only one group of bathroom fixtures, as in Picture 1, use ½-in. pipe. Where any additional fixtures are served by same risers (as additional bathroom or sink on first floor) use ¾-in. pipe.

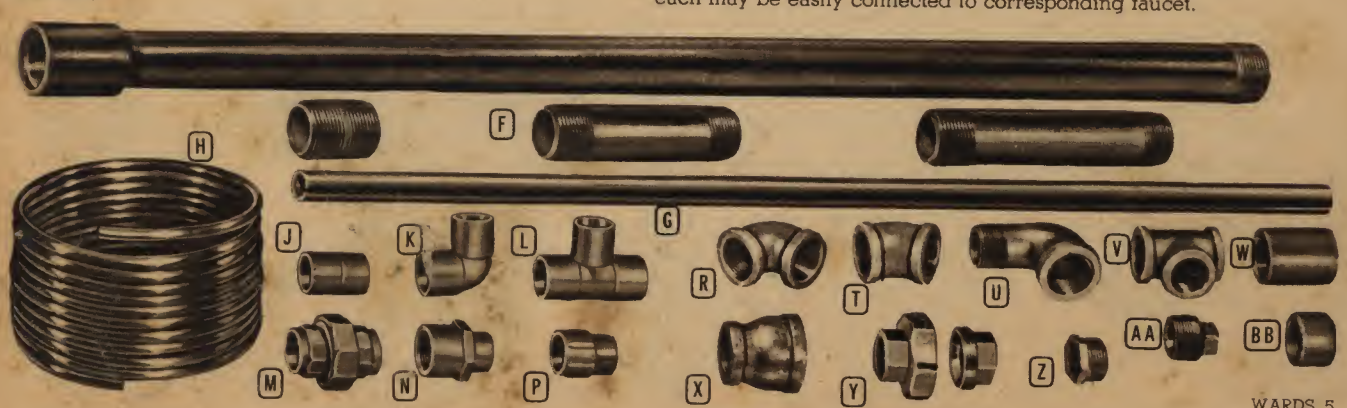
Fixture branches which distribute water to individual fixtures from risers are almost invariably ½-in. pipe.

Individual fixture supply pipes connect fixtures to fixture branches. Table gives proper size fixture supply pipes.

Fixture	Supply Pipe	Fixture	Supply Pipe
Lavatory	⅜ in.	Laundry Tub	½ in.
Bathtub	½ in.	Wall Hydrant	½ or ¾ in.
Shower	½ in.	Washing Machine	½ in.
Water Closet	⅜ in.	Water Heater	¾ or 1 in.
Kitchen Sink	½ in.	Water Softener	¾ or 1 in.

Hot water distribution is similar to cold water distribution. Use same size pipe in each case. Run pipes parallel throughout system—allowing at least 6 inches of space between them. Control valves should be included in hot water lines at same points as in cold water lines. See Picture 1.

It is customary to have the left-hand faucet on each fixture control hot water flow and the right-hand faucet control cold water flow. Plan hot and cold supply pipes so that each may be easily connected to corresponding faucet.



FIXTURES EMPTY INTO

It is as important to carry water and water borne wastes away from fixtures as to supply these fixtures with fresh, pure water. Pipes for this purpose are called "wastes" or "drains".

Waste pipes carry the discharge from all fixtures except water closets to a waste or soil stack, soil branch or house drain. Water closet discharges into a closet bend (18, Picture 2) which connects directly to soil stack (19).

Waste pipes are usually concealed in house walls or under floors. They are supported by notched floor joists, wall studs, or at connections to other piping. As with all piping, it is important to keep waste lines short and straight—with as few fittings and offsets as possible.

Horizontal runs of waste pipe must slope or pitch downward in direction of drainage—toward soil or waste stack. Amount of slope must be planned carefully. If too great, outlet of any unvented portion of waste pipe may enter stack at point lower than dip of fixture trap and siphon water from trap. On the other hand, pitch must be enough to prevent grease and solid matter from stopping in pipe. Experience has shown that horizontal runs of waste pipe, up to and including 2-in. diameter, should be pitched at least ¼-in. per foot of length.

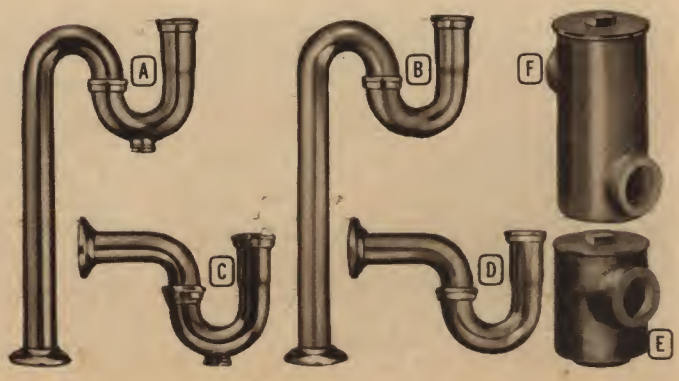
Waste pipes have been made of galvanized steel, cast iron, brass, copper or lead. Cast iron is not often used unless waste pipes must be placed in concrete or under ground. Brass or copper in waste pipe sizes is expensive. Lead pipe is very difficult to handle and is installed only if required by code.

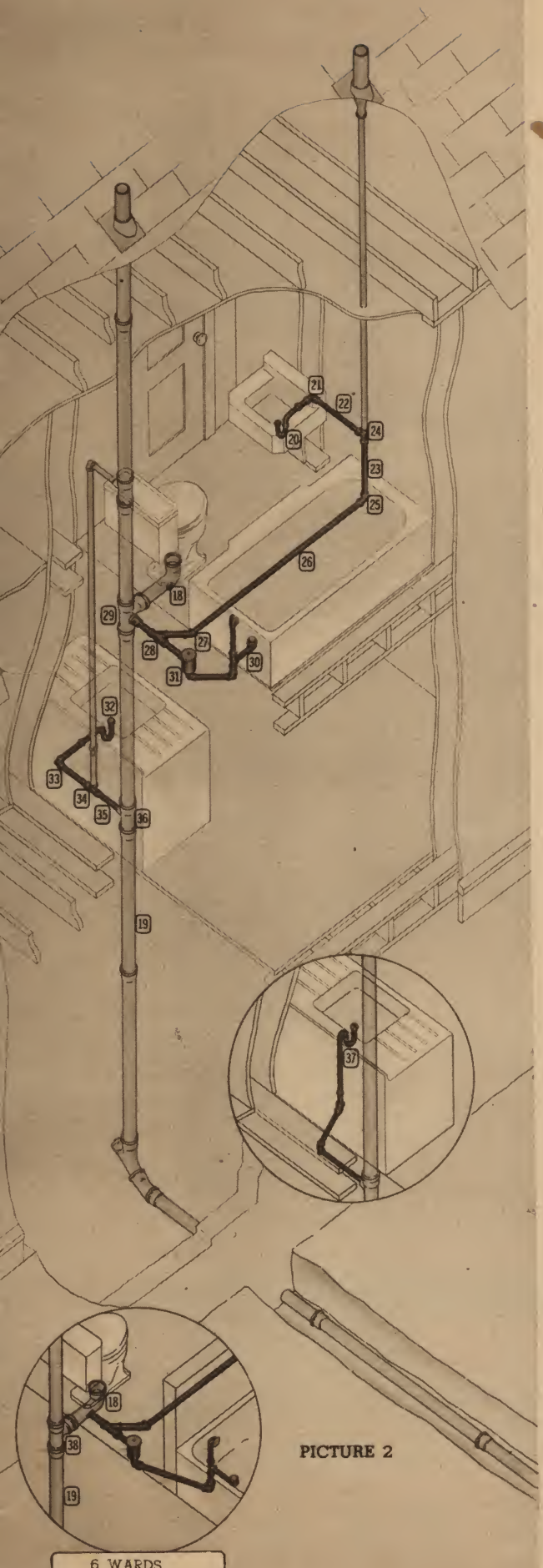
Galvanized steel is most widely used and is most practical waste pipe for diameters up to 2 in.—adequate for most residences and small business or farm buildings. It is usually made in 21-ft. lengths and cut on the job to fit installation. The cut ends are threaded to match drainage fittings used to assemble system. See Page 26 for cutting and threading pipe.

Drainage fittings are somewhat different from standard pipe fittings used for water distribution or venting. This is necessary to form a smooth, unobstructed joint for free flow of wastes. Turns are longer to lessen chance of stoppage. Threads in side opening of drainage tee are cut at a slight angle to allow for proper slope of connecting waste line.

Common drainage fittings used for waste pipe connections are pictured below. They include: 90° elbow (G), 90° long turn elbow (H), 90° street elbow (J), 45° elbow (K), tee branch (L), 90° long turn branch (M), 45° Y branch (N) hub vent fitting (P) and galvanized P trap (R).

Volume of water wasted through each type of fixture determines proper size for waste pipe. Table (Pg. 7) shows recommended steel pipe sizes (inside diam.). Trap at each fixture





PICTURE 2

WASTE PIPES...TRAPS KEEP OUT ODORS

should be same size as waste pipe, except lavatory which takes 1¼-in. trap and bathtub which uses drum type trap.

WASTE PIPE AND TRAP SIZES FOR INDIVIDUAL FIXTURES		
Fixtures	Size of Waste Pipe in Inches	Size of Trap in Inches
Kitchen Sink	1½ or 2	1½
Lavatory	1½	1¼
Bathtub	1½	4 x 5 x 1½ or
Bathtub with Shower	1½	4 x 8 x 1½ drum
Cabinet Shower	1½ or 2	1½, 2 or drum
Laundry Tub	1½	1½
Floor Drain	2 or 3	2 or 3

For the average residence, with not more than two or three fixtures draining into the same horizontal waste line, select pipe the same size as largest waste pipe serving any individual fixture.

A trap must be provided for each fixture connecting to waste lines, except water closet (which has trap built-in). Trap installed in waste or drain line holds a water seal. This water seal prevents sewage odors and vermin from entering rooms through drain pipes.

"S" type or "P" type trap is used for fixtures hung on wall, or set on cabinets or pedestals. Such fixtures include lavatories, sinks and laundry tubs. S-trap (A) or (B) is used if drain connection is made under floor. Use P-trap (C) or (D) where drain pipes run in wall. As these traps are often exposed to view, they are usually chromium plated. While plumbing codes may differ, traps (A) and (C) with cleanout plugs are usually recommended. Traps (B) and (D) are similar but do not have cleanout plugs.

Drum type trap is used for bathtub and often for cabinet and stall showers. Easier to install beneath floor, it has larger capacity—can pass greater volume of water in less time. There are two common drum trap sizes. The 4-by 5-in. (E) has a threaded tapping on bottom and a threaded tapping on side near top. Bottom tapping receives a street elbow to which horizontal waste pipe is screwed. Side tapping receives horizontal waste pipe directly.

Where drum trap is installed on second floor, cover should be flush with floor so it can be removed for easy cleaning of trap. If installed on first floor of house with basement, trap is usually inverted so that cover is down and trap can be cleaned from basement. Inverting drum trap in this manner does not affect its operation.

A 4- by 8-in. drum trap (F) is often used with second floor bathtub where limited space under floor makes it difficult to install a 4- by 5-in. trap with street elbow joined to bottom. This trap has two threaded side tappings so that waste pipe connections can be made without the elbow.

Most common use of trap (R) is with tub or sink in basement, utility room, garage or outbuilding. It may also be used with stall or cabinet shower in place of drum trap.

Install each trap as close to fixture outlet as possible. Avoid long vertical distance between fixture opening and bend of trap, to prevent waste water from running too fast through trap and possibly breaking water seal.

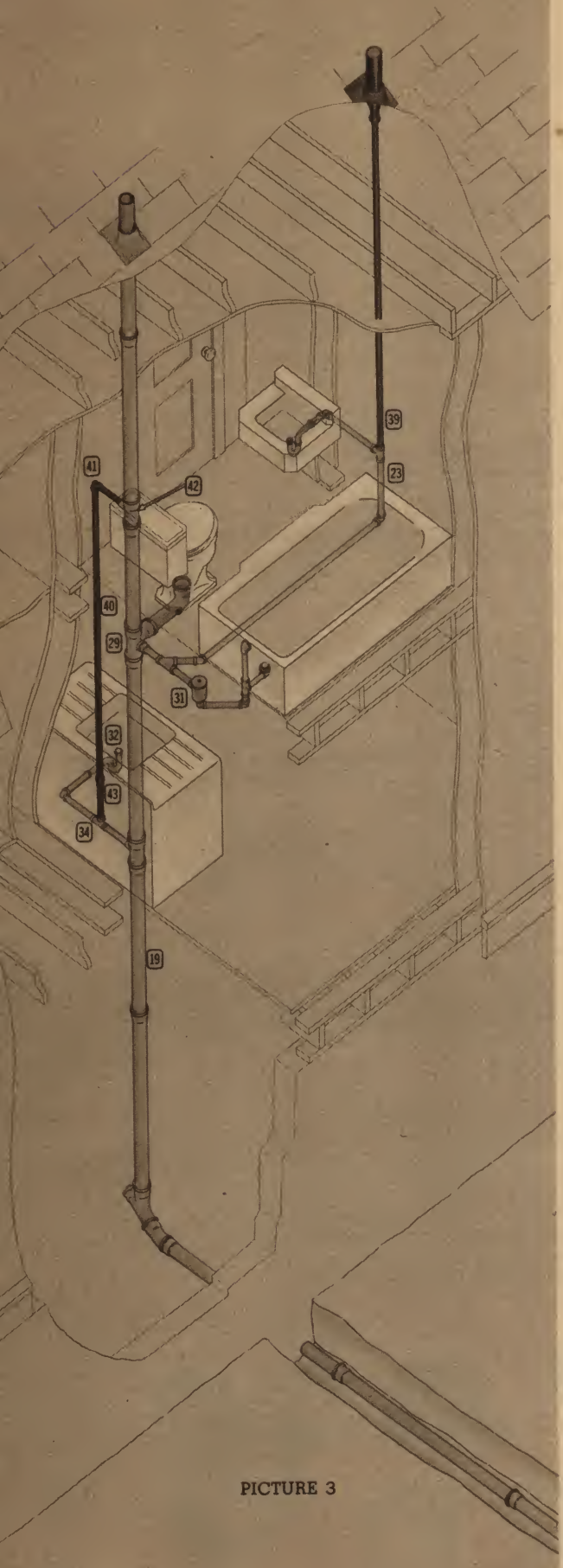
There are several devices such as garbage disposer, dishwasher, home laundry, etc. used in connection with regular plumbing fixtures. Such equipment when properly hooked up does not interfere with efficiency of waste system.

Refer to Picture 2 at left for easy identification of waste lines in a typical plumbing system.

All waste lines and closet bend (18) discharge into soil stack (19). Lavatory in upstairs bathroom empties into 1¼-in. P-trap (20) the tailpiece of which joins 1½-in. nipple extending through front of wall. Slip joint connection is made between 1¼-in. trap and 1½-in. nipple with slipnut, friction ring and washer. Other end of nipple connects to 1½-in. drainage elbow (21) which with pipe (22) carries wastes to vertical waste pipe (23). Drainage tee (24) forms connection. Elbow (25) guides wastes through horizontal waste line (26), under floor, to 45° elbow (27) and 45° Y branch (28). Wastes then enter 1½-in. tapped spigot which is calked to side inlet of sanitary tee (29) in soil stack (19).

Combination overflow and tub waste (30) drains through elbow and pipe to drum trap (31). Connection is then made to 45° Y branch (28). As an alternative, waste lines could be connected to 1½-in. side tapping of closet bend (18) instead of side inlet of (29). See inset. In this case, a sanitary tee (38) without side inlet would be used to connect closet bend to stack (19).

Wastes from kitchen sink downstairs reach soil stack through P-trap (32), nipple and elbow to horizontal waste pipe (33), tee (34) and continue through nipple (35) to 1½-in. (pipe size) side tapping of tee (36) in soil stack. Purpose of tee (34) is to receive vent pipe for sink trap (32). Inset shows connections when S-trap (37) is used with sink. Waste pipes run under floor instead of in wall. This arrangement is not usually recommended because trap cannot be vented. Discussion of vent pipes follows.



PICTURE 3

VENTS AID TRAPS...

A Drainage System cannot function properly without adequate ventilation. This important part of the plumbing system equalizes pressure in traps and waste and drain pipes with pressure in the surrounding air. If system is not vented, uneven pressures may develop and force or siphon water from traps—breaking water seal and slowing waste flow.

Good general practice is for each plumbing fixture to be vented within 5 feet horizontally of its trap. (Follow local code, however.) If a vent is needed, connect one end to waste line as close to trap as possible. Other end connects into upper part of soil or waste stack or to another vent pipe, or may continue independently through roof to open air. Vents are most commonly connected to soil stack—*above point of highest fixture waste connection.*

Where plumbing fixtures empty into the same stack at different levels—as second floor bathroom over first floor bathroom or kitchen—fixtures on lower floor require venting to stack above highest fixture waste connection upstairs. Lower of two water closets need not be vented. (Where three closets connect to same stack, however, lowest must be vented with a separate 2-in. vent pipe.)

Vent pipes are not usually needed where fixtures and their traps are installed within 5 feet of stack and no other fixtures discharge into same stack at higher level. This simplification is therefore practically limited to (1) one-story house with no basement fixtures; (2) two-story house with all fixtures on one floor; (3) fixtures on two or more floor levels with separate stack for each floor. For examples of fixture arrangements and hook-ups not requiring separate vent pipes, see Simplified System, Pages 12 and 13.

In any case where lavatory waste drops to floor level before joining stack, as in Picture 3, a vent is required. To eliminate separate vent, lavatory waste must run horizontally to stack (with usual pitch) at about the level of P-trap outlet.

Isolated groups of fixtures or individual fixtures installed far from soil stack should have a separate waste stack. This stack may extend through roof or cut across attic space to join soil stack. Same venting rules apply to fixtures served by waste stack as to fixtures served by soil stack.

Vent system usually is assembled from standard galvanized steel pipe and regular malleable iron fittings. Drainage type fittings (used for waste lines) NOT necessary for venting.

It is important to use proper size pipe whether venting a single fixture or group of fixtures. Where more than one fixture vents through same pipe, use largest pipe size recommended for any fixture served. Table below gives minimum recommended vent pipe sizes for fixtures listed.

FIXTURE	Lavatory	Sink	Closet	Bathtub	Shower	Laundry Tub
VENT PIPE	1½ in.	1½ in.	2 in.	1½ in.	1½ in.	1½ in.

Entire vent system usually is concealed within building partitions and is supported by partition framing. Runs are seldom long enough to require special clamps or hangers for support. The vent system is assembled along with the waste system and connects to it with regular threaded fittings.

Horizontal runs of vent pipe should slope upward slightly toward soil or waste stack so that any moisture condensing inside pipe will drain freely into waste system. No definite amount of pitch is required for vent pipe.

SPEED WASTE FLOW

Venting principles as applied to typical system are shown in Picture 3. Highest waste connection to soil stack (19) is at sanitary tee (29). Above this point, stack carries no wastes and vents closet to open air above roof. Bathtub trap (31) is within 5 feet of stack, so needs no additional venting.

Lavatory has vertical waste (23) so requires an individual vent (39) of 1½-in. pipe (see table above). Vent is run straight up through roof. (Picture 4 shows an alternative installation where vent is run above attic joists to soil stack.) If lavatory were within 5 feet of stack and located so that high waste line could be used, individual vent would not be needed. See Simplified System Pages 12 and 13.

Normally sink trap (32) requires no vent as it is within 5 feet of stack. In this case, however, bathroom fixtures upstairs waste into stack above sink connection. Therefore, sink must have individual vent connecting to stack above highest waste connection (29). This 1½-in. sink vent (40) connects to sink waste at 1½-in. tee (34). Vent continues to 90° elbow (41) and joins stack at tapped tee (42).

As vent pipe (40) cannot be screwed into fittings at both ends because of thread direction, hub-vent fitting (43) is used. Bottom of hub-vent has threads for screwing to pipe. Top is in form of a hub, without threads, so that it can be calked into position. Some adjustment is possible in this calked joint, allowing a small margin of error in pipe cutting.

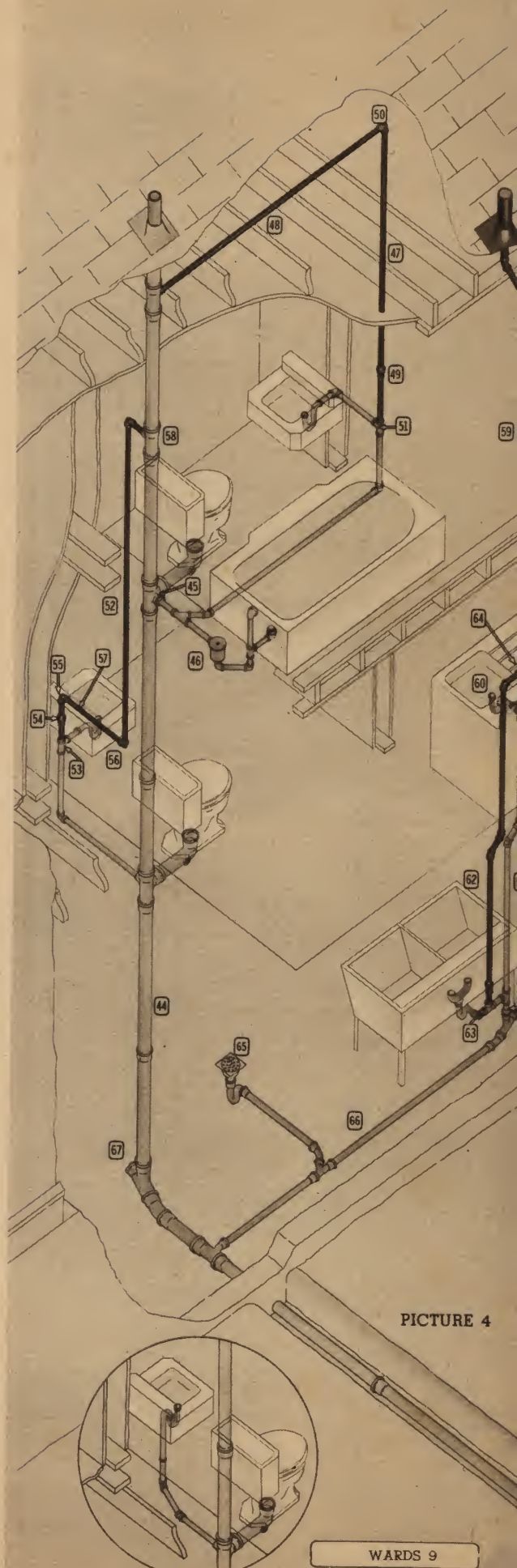
Picture 4 illustrates venting of a larger plumbing system with more fixtures and requiring a separate waste stack.

Main soil stack (44) serves upstairs bathroom and downstairs powder room. Highest waste connection (45) receives waste from closet, bathtub and lavatory. Closet and bathtub trap (46) are vented directly by upper portion of soil stack which carries no wastes. Lavatory vents to stack through pipes (47) and (48). Hub-vent fitting (49) is used because single length of pipe with standard threads at each end cannot be screwed to both elbow (50) and tee (51). Powder room lavatory is vented from above P-trap to upper part of soil stack through 1½-in. pipe (52). Connection is made to 1½-in. tee (53). Hub-vent fitting (54) is installed in vertical vent line. Elbows (55) and (56) with pipe (57) offset vent so it will not conflict with a recessed medicine cabinet installed over lavatory. Vent then connects to stack at side opening of tapped tee (58).

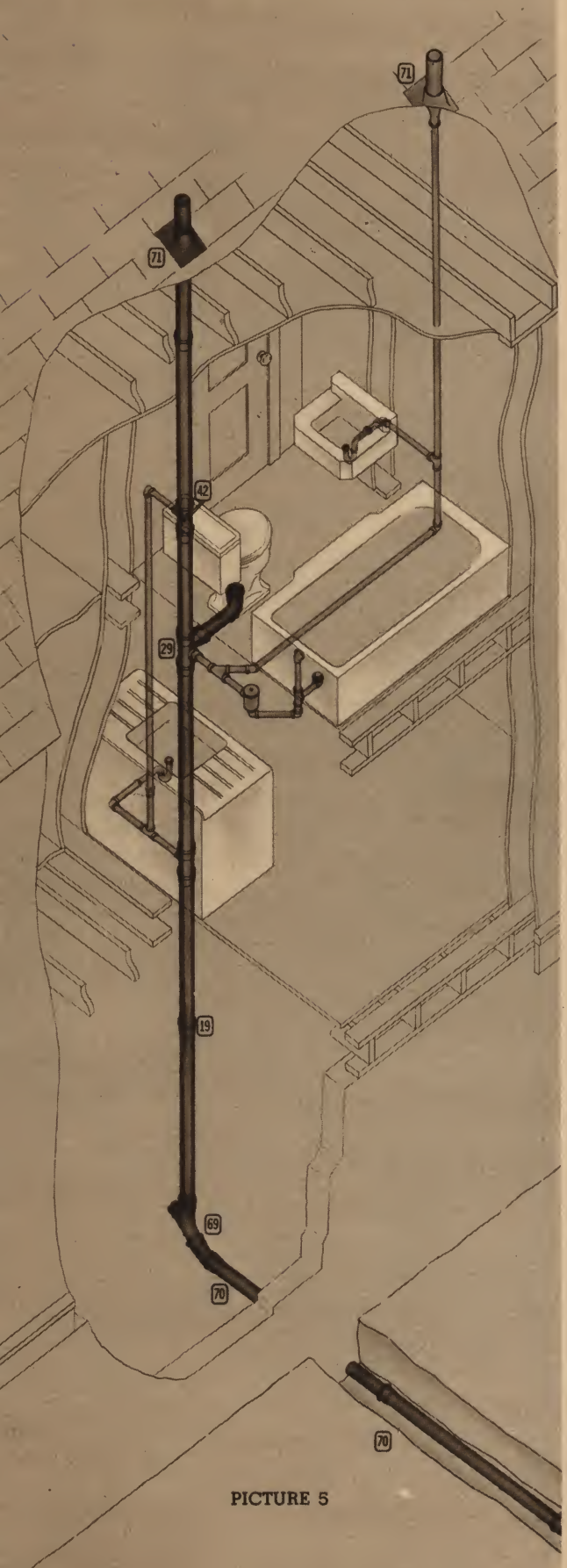
Inset picture shows lavatory connections with an S-trap to floor sometimes used for small installations requiring no separate vent. It would not be recommended here, where a vent connection is needed.

Because of the distance from soil stack (44), kitchen sink and laundry tub are served by a separate 1½-in., or better 2-in., waste stack (59). Sink trap (60) is vented directly by this stack extending through roof. Sink waste joins stack at tee (61).

Laundry tub in basement also drains into stack (59). Separate vent pipe (62) is needed as sink drains into stack at higher level. This 1½-in. vent pipe connects to laundry tub waste at 1½-in. tee (63) and extends above highest waste connection (61) to 1½-in. tee (64) where it joins stack. Basement floor drain (65) is connected to horizontal soil branch (66) which carries wastes from stack (59) to house drain. Cleanouts (67) and (68) are required so that horizontal drain lines can be rodded out in case of stoppage.



PICTURE 4



PICTURE 5

SOIL STACK COLLECTS

The soil stack (19, Picture 5) is a continuous, vertical run of soil pipe extending from its base (69) at house drain connection, upward through roof to open air. It receives the discharge from closets and from waste pipes serving other fixtures, carrying all wastes to house drain (70). Portion of soil stack above highest waste connection (29) is for ventilation only—directly venting closets and receiving vent pipes from other fixtures. In Picture 5, typical vent connection is made at tapped tee (42).

Cast-iron pipe is the most suitable material for soil stack. (Steel pipe is satisfactory for venting portion above highest fixture connection, if code permits.) Cast-iron soil pipe is supplied in 5-ft. lengths and two types: single-hub type (A, Page 11) and double-hub type (B). Double-hub type is cut to make two pieces shorter than 5 ft. Soil pipe now comes in 2 weights: a medium-heavy (or "victory") weight and extra-heavy. Check code.

Practical diameter (inside) for portion of soil stack carrying wastes in typical home is 3 in. This is ample to serve one or two closets and other usual home fixtures. However, 4-in. stacks are required by plumbing codes in some localities. Check your local code before deciding stack size.

A soil stack receiving discharge of fixtures at two or more levels—as in two- or three-story house—should be the same diameter from house drain to roof. Where all fixtures are on one level, vent portion of stack above highest waste connection may be reduced to 2-in. inside diam. without lowering efficiency. (See simplified system on Pages 12 and 13.)

In areas of severe cold, there is danger of frost sealing top of 2-in. stack. In such an area, enlarge stack to 4 or 5 in. with suitable increaser, connected about one foot below roof level and extending through roof. Fit proper size roof flashing (71) over top of 3- or 4-in. stack (or increaser) for watertight seal between stack and roof.

In new construction, stack is easily concealed inside of partitions. In modernizing an old house, this requires cutting away some plaster and lath and notching or cutting (and often reinforcing) parts of building framing. There are several methods that avoid cutting into partitions. The easiest, where space permits, is to locate the stack outside of wall or partition and cover by boxing in, or furring out from original wall as shown in Picture 6. The space to the sides of stack may often be used for built-in storage cabinets or shelves, or may be finished solid. A second method is to run stack in a corner, and cover it by furring across corner (Picture 7). A third method is to run stack in a nearby storage closet or pantry where it is least noticeable.

In very mild climates, stack may be run on outside of house as in Picture 8. Outside stack can be painted or boxed in.

Choose stack location carefully. Have water closet and stack adjacent as shown in Picture 5. Avoid conflict with windows, doors, electrical wiring and outlets in walls. Be sure house drain can be installed so as to meet base of stack. Consider where the stack will be on all floors—remember it must be vertically straight from house drain to roof.

Stack is erected by inserting spigot end of pipe or fitting into hub end of preceding lower pipe or fitting and calking joint. (Always form joints of cast-iron lines so that drainage flows out of spigot end into hub end of next piece—in other words, with hub at higher end of each piece.) (Cutting and joining cast-iron pipe described on Page 26.)

As stack installation proceeds, calk in proper fittings for connection of closet bends, waste pipes and vent branches. Most

WASTES; EXPELS ODORS

commonly used soil pipe fittings are shown below. They include: closet bend with 1½-in. side tappings (C), ⅛-bend (D), ¼-bend (E), 45° Y branch (F), sanitary tee (G), sanitary tee with 2-in. hub inlet (H), threaded calking sleeve spigot for joining waste line to hub inlet (J), tapped tee (K), vent increaser (L) and cleanout ferrule (M). Many of these fittings are shown in stack (19), Picture 5.

If it is necessary to have one or more closets too far from soil stack to be reached by closet bend, install either an additional stack or a horizontal branch of 3- or 4-in. soil pipe.

Waste stack (59, Picture 4, Page 9) serves fixtures too far away to be connected to soil stack. Use only where NO water closets connect. Waste stack connects at base to house drain or to horizontal branch leading to house drain. Top extends through roof or may run across attic and connect to upper portion of soil stack. Waste stacks are 1½- or 2-in. galvanized steel pipe, with fittings.

The house drain (70, Picture 5) is the lowest horizontal drain in the building and receives discharge of soil stacks, waste stacks, soil branches and floor drains. This collecting line carries all house drainage at least 5 feet beyond foundation wall to join house sewer. Install beneath basement or ground floor or suspend from basement ceiling. Maintain a slope of about ¼-in. per foot of length for proper waste flow.

The house drain below basement floor is usually 4-inch cast-iron soil pipe with calked joints, though it may be 4-in. *vitrified* tile with cemented joints. Where drain is suspended from basement ceiling (often necessary where septic tank is used) it MUST be cast-iron soil pipe.

House drain should be same diam. as stack, or larger. If it is 3 in., increase to 4 in. before passing through foundation wall. Codes in some localities require a 4-in. house drain; in such cases, with 3-in. stack, increase to 4 in. at stack base.

The house sewer connects to the outside end of house drain—about 5 feet beyond building wall—and runs to city sewer or septic tank. House sewer is usually 4-in. cast-iron soil pipe. Bituminized fiber 4-in. pipe or 6-in. *vitrified* clay tile may be used.

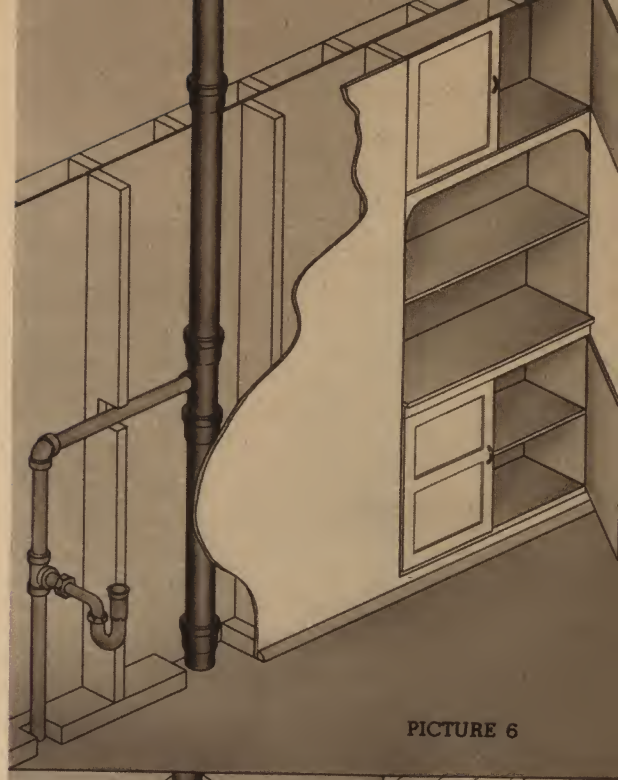
If soil is loose, swampy, unstable or contains numerous tree roots, cast-iron pipe is strongly recommended to avoid root infiltration and clogging. Never put cinders or ashes near cast-iron pipe; they produce an acid which corrodes iron.

Sewer line should slope toward city sewer or septic tank at rate of at least ¼-in. per foot of length. Where septic tank or sewer is at a much lower elevation than house, grade may have to be increased. However, limit grade to ¼-in. per foot for last 15 or 20 feet before entering septic tank, to prevent sewage from rushing into tank and disturbing action.

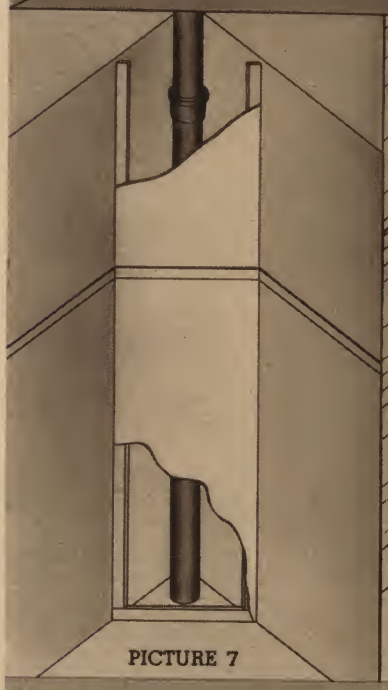
A few communities require a catch basin in yard between house and city sewer to intercept grease from the kitchen sink. See local plumbing code for requirements.

Storm water running from roofs, areaways or yards should be disposed of through separate means. This water is relatively pure and may usually be drained into ditch, creek, river, lake or other means of disposal on surface without treatment.

Cities having sewage treatment plants usually provide separate storm sewers. Otherwise storm drains may terminate at curb, drainage ditch or other collection point. *Never* drain storm water into a septic tank system as it will flood tank and seriously interfere with its action.



PICTURE 6



PICTURE 7

PICTURE 8

THIS SIMPLE SYSTEM MAY FIT

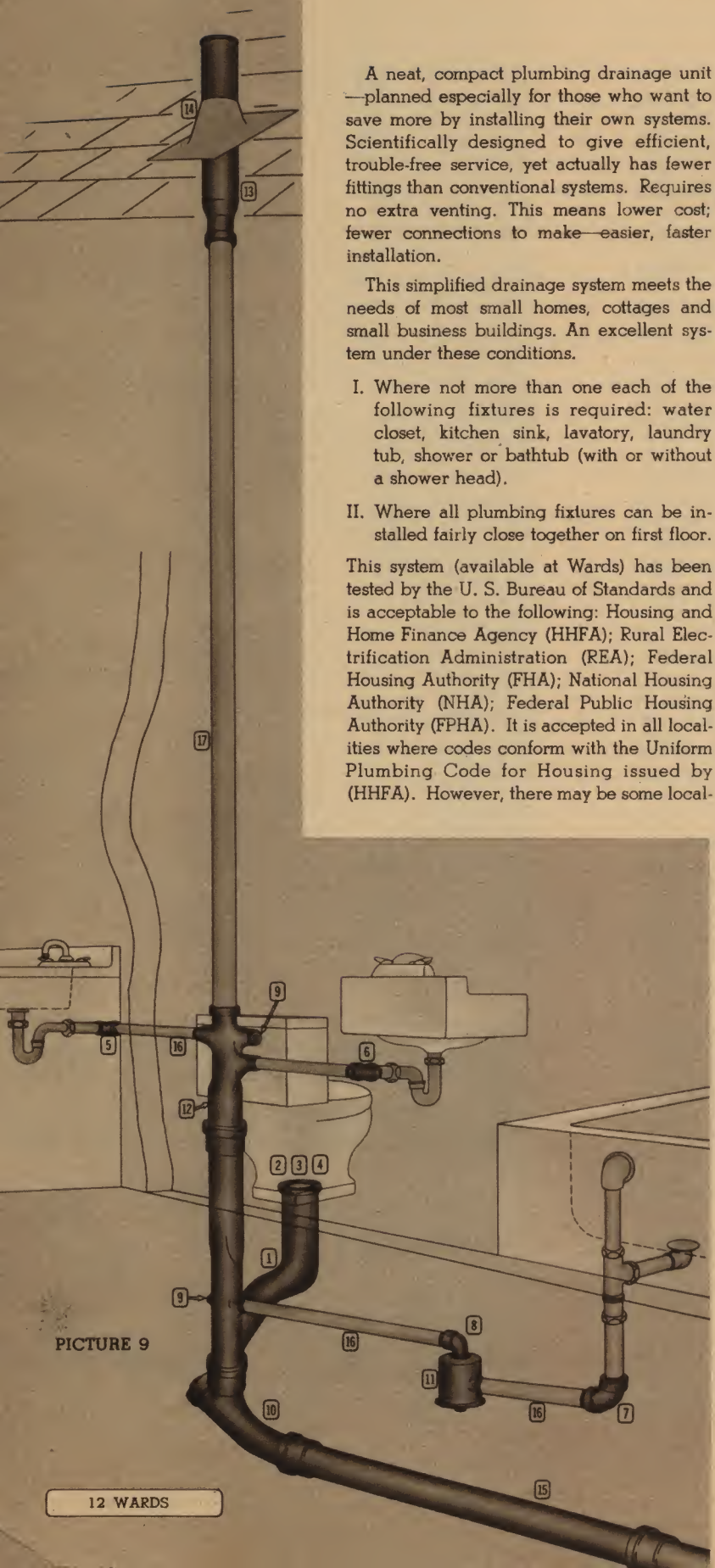
A neat, compact plumbing drainage unit —planned especially for those who want to save more by installing their own systems. Scientifically designed to give efficient, trouble-free service, yet actually has fewer fittings than conventional systems. Requires no extra venting. This means lower cost; fewer connections to make—easier, faster installation.

This simplified drainage system meets the needs of most small homes, cottages and small business buildings. An excellent system under these conditions.

I. Where not more than one each of the following fixtures is required: water closet, kitchen sink, lavatory, laundry tub, shower or bathtub (with or without a shower head).

II. Where all plumbing fixtures can be installed fairly close together on first floor.

This system (available at Wards) has been tested by the U. S. Bureau of Standards and is acceptable to the following: Housing and Home Finance Agency (HHFA); Rural Electrification Administration (REA); Federal Housing Authority (FHA); National Housing Authority (NHA); Federal Public Housing Authority (FPHA). It is accepted in all localities where codes conform with the Uniform Plumbing Code for Housing issued by (HHFA). However, there may be some localities where state or local codes require the more complicated conventional system.



PICTURE 9

Picture 9 shows one of several possible fixture arrangements and identifies basic items in simplified system using 2-in. vent pipe and fitting into standard 2-by 4-in. partition. Simplified system requires:

(1) CLOSET-TUB FITTING. Semi-flat shape, equal to 3 in. diam., with 4-in. closet bend opening. Two 1½-in. sanitary iron pipe tappings.

(2) ASBESTOS CLOSET GASKET. For tight, non-leaking closet connection.

(3) BRASS BOLTS. Have washers and nuts.

(4) CLOSET COLLAR. Cast-iron. Size 4 in.

(5) (6) (7) THREE 90° ELBOWS. Size 1½ in.

(8) 90° STREET ELBOW. Size 1½ in.

(9) TWO CAST-IRON PLUGS. Size 1½ in.

(10) STACK BASE. Size 3 in. Has cleanout.

(11) TUB OR SHOWER DRUM TRAP. Cast-iron. Size is 4 by 5 in. with 1½-in. tappings. Cleanout cover and gasket included.

(12) LAVATORY-SINK FITTING. Semi-flat; equal to 3-in. diam. With three 1½-in. sanitary tappings.

VENT ADAPTER (not shown). Screws into Lavatory-Sink Fitting (12) if unthreaded vent pipe such as cast-iron is to be calked in.

For localities where a 3-in. vent pipe is required there is a similar set with (1) and (12) round in shape, and with larger top opening. Larger size vent adapter is also required. This 3-in. system requires a 5½-in. stud partition.

Additional materials needed vary with installation. These include:

(13) VENT INCREASER. Screws to top of 2-in. steel vent pipe to enlarge diameter of vent extending through roof to 4-in. Necessary to prevent frost accumulation from closing end of vent (except in mild climate).

(14) ROOF FLASHING. Fits over increaser or soil pipe to make roof opening watertight.

(15) CAST-IRON SOIL PIPE. For house drain. (Also in place of 2-in. Galvanized Steel Pipe (17) where 3-in. vent is required.)

(16) 1½-IN. GALVANIZED STEEL PIPE. For fixture waste lines. Length of each depends upon fixture location.

(17) 2-IN. GALVANIZED STEEL PIPE. For vent-stack.

Pictures 9, 10 and 11 show typical installations. System can be adapted to other layouts with allowances for various distances and fixture locations. Main units of system are correspondingly numbered in each picture.

YOUR NEEDS

To install system, first determine best location for vent-stack and closet. Stack consists of straight section of Closet-Tub Fitting (1), Lavatory-Sink Fitting (12) and galvanized steel vent pipe (17). Locate in inside partition or other convenient place not subject to freezing. If putting in partition, select open space that clears studs and floor joists.

Install closet against same wall—adjacent to stack, so that closet bowl outlet will line up with closet bend. To fit this system, use closet that measures 14 in. or less from back of tank to center of closet bowl outlet.

Begin actual installation by placing Closet-Tub Fitting (1) temporarily in place below floor (or measuring carefully) and marking floor where closet bend must come through. Cut hole large enough to receive small end of closet collar. Then install Closet-Tub Fitting permanently in position with closet bend sticking up into hole in floor to within ½ to ¾ in. of floor surface. Support with metal or wood hanger.

Depth of house drain governs location of Stack-Base Fitting (10). In most cases where house drain is suspended from basement ceiling or house has no basement, (10) can be calked directly to Closet-Tub Fitting (1). See Picture 9. Minimum space of 18 in. beneath floor is required for this connection. If house drain is lower—as under basement floor—use 3-in. soil pipe to connect (10) and (1) as shown in Pictures 10 and 11. Point outlet of (10) exactly toward sewer line.

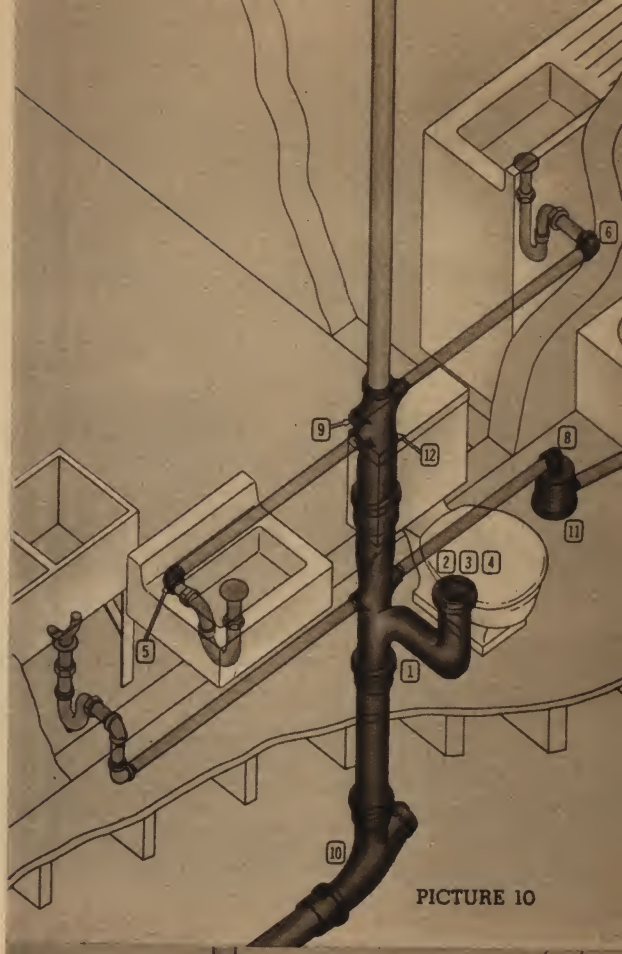
Lavatory-Sink Fitting is installed next. Slips up and down in (1) (before calking) for height adjustment to receive waste pipes from fixtures. Three tappings provide flexibility in the number and type of fixtures that may be installed. If only two fixtures will be used, close third tapping with cast iron plug.

Heights of fixture waste outlets determine proper height of (12). Mark position where waste pipe from each fixture trap will enter wall. Adjust (12) to correct height in (1) so that height of lower tapping equals height of lowest waste pipe outlet as marked on wall. Then lower just enough to allow for ¼-in. per foot downward slope of waste pipe from fixture. (All tappings are properly pitched.) Calk (12) to Closet-Tub Fitting (1).

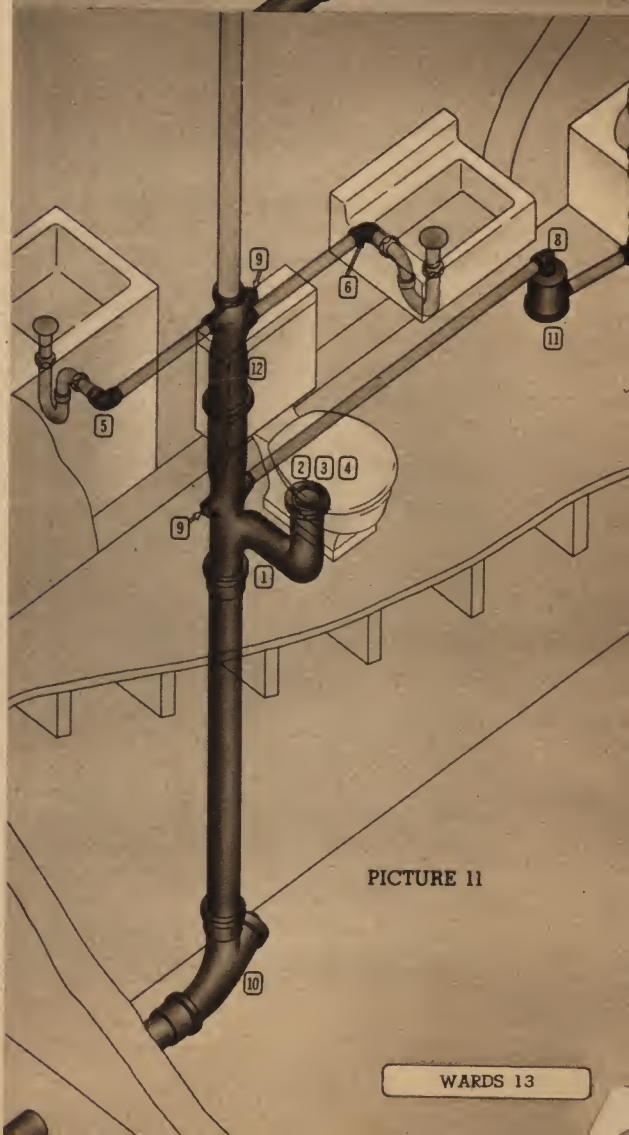
Determine length of 2-in. vent pipe (17) necessary to reach from top of (12) to bottom of 2- by 4-in. increaser (13), with increaser extending through roof about one foot. Cut and thread vent pipe and screw to lavatory-sink fitting—then screw on increaser. Slide 4-in. flashing (14) over increaser and anchor to roof. Hammer lead collar around increaser—calk—then work mastic calking compound or roof cement around joint. (For 3-in. stack without increaser, use 3-in. flashing.)

Complete waste lines by running pipe from Lavatory-Sink Fitting (12) to positions marked for waste outlets. Waste line connecting Closet-Tub Fitting (1) and Tub-Shower Trap (11) runs beneath floor or below basement ceiling joists. Drum Trap is installed with trap cover down. The 90° trap elbow (8) is screwed into top of trap. Use 90° drainage elbows (5), (6) and (7) where necessary to make turns in waste lines.

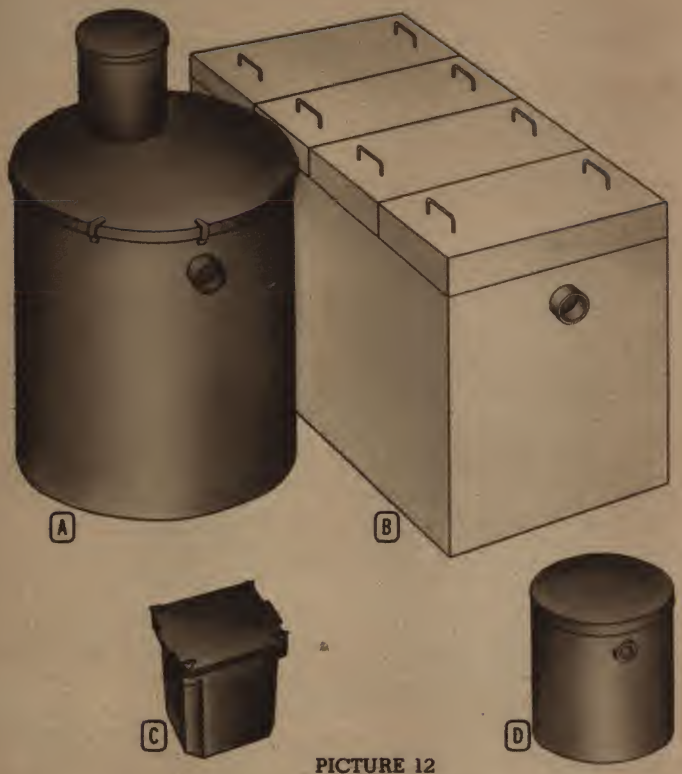
To install closet, place closet bolts in closet collar so threaded ends extend upward through flange. Set collar in floor over top of closet bend and calk in place. Then put asbestos gasket over closet bottom outlet, or spread closet setting compound. Set closet in place and tighten nuts on collar bolts. Check additional detailed instructions included with simplified system and closet.



PICTURE 10



PICTURE 11



PICTURE 12

PICTURE 13

SEPTIC TANK AND DRAIN

A septic tank system with drain field is the only satisfactory, practical method of sewage disposal for a building not served by city sewers. If properly installed this system is safe and efficient—requiring little attention. (Septic tank is for household wastes. Do not drain storm water or strong solutions, such as pickle brine, into tank.)

Tank must be watertight. Two common types are shown in Picture 12. Heavy steel type (A) is bought ready to install. Concrete type (B) is usually constructed on the site. Walls and floor should be 6 to 8 inches thick and reinforced with steel rods. Cover must fit tightly to keep out dirt. Equip one-piece cover with manhole for cleaning tank.

If you plan to build your own concrete septic tank, you may get helpful information from your local Health Officer, State Dept. of Health, U. S. Public Health Service, U. S. Dept. of Agriculture, or Portland Cement Ass'n., Chicago.

Picture 13 shows septic tank operation. Sewage from house enters tank at (1). This sewage is composed of water, dissolved substances, mineral and organic solids, and grease particles. Bacteria in tank act upon the organic solids, breaking them down into liquids and gases. These liquids mix with the other liquids in tank, while the gases escape through stack and sewer lines. (No chemicals are used in a septic tank system.)

Of the mineral solids, heavier particles settle to the tank bottom forming a layer of sludge (2). Lighter particles and grease rise to the surface to form a scum (3). As additional sewage enters tank at (1), an equal volume flows out through (4) to drain field.

Sludge is removed from tank, usually once every three or four years. Sludge should be carefully buried where it can't contaminate fresh water supply or growing food crops.

Size of septic tank is important. Smallest acceptable capacity for a farm is 500 gallons, usually adequate for 5 or fewer persons. A small home or cottage with fewer than 4 persons may be served adequately by a 300-gallon tank. In any case where kitchen sink has an automatic garbage disposer, provide 30% to 50% greater capacity and not less than 500 gals.

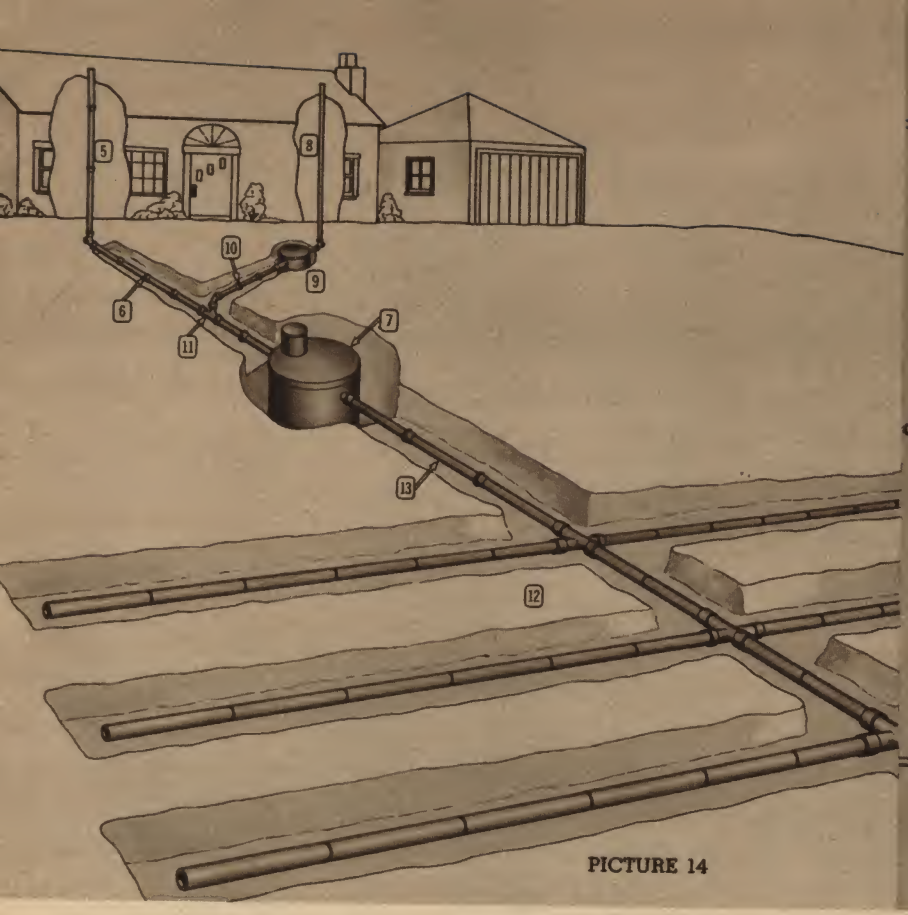
Two or more steel tanks may be hooked up together for large capacity by connecting outlet of one to inlet of the other with a short length of soil pipe. If building concrete tank, use table below to determine size.

Gallon Capacity of Tank	Maximum Number of Persons	Inside Tank Dimensions		
		Length	Width	Depth
500	5	6 ft.	3 ft.	5 ft.
600	6	7 ft.	3 ft.	5 ft.
750	8	7½ ft.	3½ ft.	5 ft.
900	10	8½ ft.	3½ ft.	5 ft.
1100	12	8½ ft.	4 ft.	5½ ft.

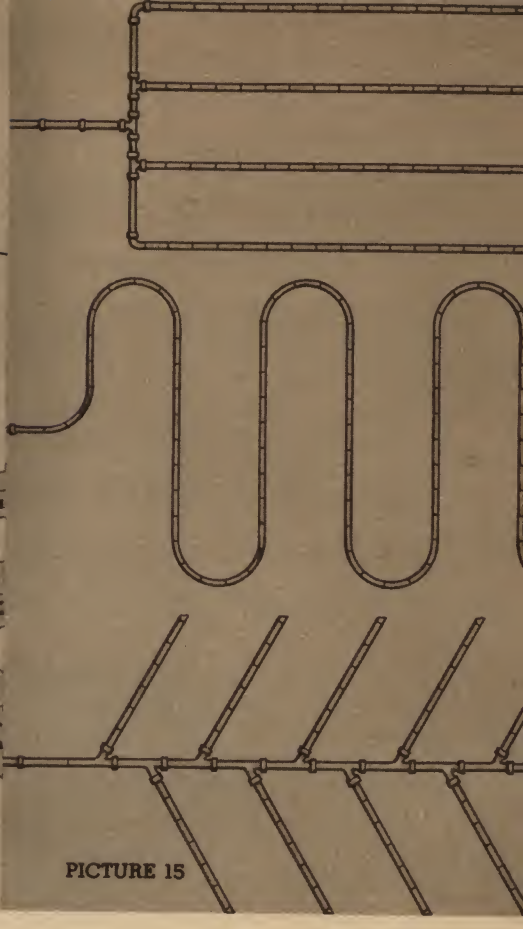
Tank should be at least 100 feet and preferably down grade from any well or other drinking water source. Tank may be located near house if space is limited, but 50 to 100 feet distance is more desirable.

In choosing location, consider grade of sewer line from house to tank. If too steep, sewage will rush into tank and disturb operation; if too slight, stoppage may occur. A grade of about 1 foot per 50 feet of length is recommended.

Dig pit for tank deep enough so that top of tank will be 12 to 18 inches below surface. Cover with earth to assure



PICTURE 14



PICTURE 15

FIELD DISPOSE OF SEWAGE

a more constant tank temperature which aids bacterial growth. Tank should rest on a solid base. If soil is not firm, cover bottom of pit with brick or stone.

Dig trench from pit to house for sewer line. Use cast iron or vitrified tile pipe for sewer. Joints must be absolutely tight to prevent untreated sewage from escaping and contaminating fresh water supply.

Drain field, which receives discharge from the septic tank, should also be at least 100 feet from any fresh water source. Select a site with few trees and shrubs so field will receive plenty of sunlight and fresh air.

Connecting drain field directly to tank is satisfactory if both can be kept beyond minimum distance from water source, and terrain is suitable. Where safety or other factors require that drain field be some distance from tank, construct connecting line of 4-in. cast-iron or vitrified tile pipe with watertight joints.

Pattern of drain field depends upon ground contours. Lines should lie crosswise to general ground slope to avoid excessive pitch and keep liquids from running too fast. Pitch of drain tiles should be slight—only about 1 inch for each 10 feet of pipe. Picture 15 above shows three common drain field layouts.

For drain field use open joint field or *drain* tile (not vitrified) or perforated bituminized fiber drain pipe of 4-in. diam. Special fittings form joints of intersection. Field tile is laid with open joints about ⅛th inch apart to permit escape of fluids to soil. Parallel drain field lines should be spaced 10 to 12 feet apart.

Amount of pipe needed depends upon type of soil and number of persons using system; see table below.

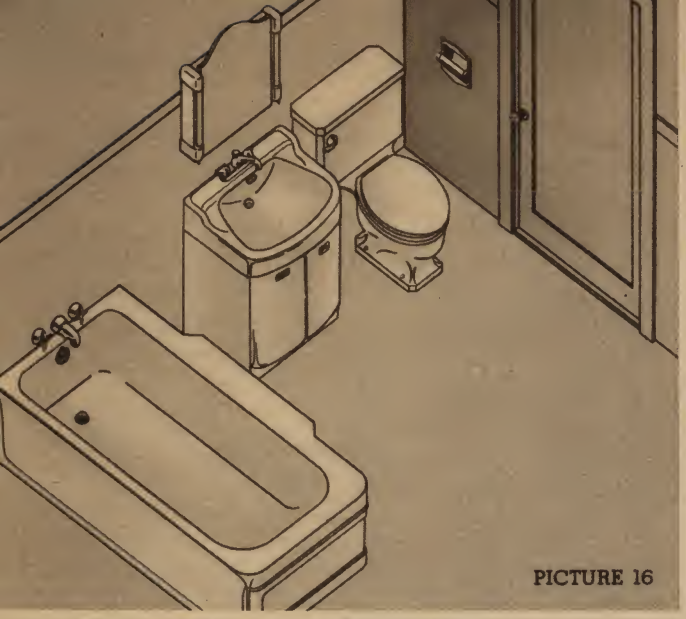
Type of Soil Where Installing Drain Field	Number of Feet of Pipe Required for Each Person
Coarse Sand or Gravel	15
Fine Sand or Light Loam	20
Sand with some Clay or Loam	30
Clay with some Sand or Gravel	80
Heavy Clay	Not Suitable

Dig trenches so that pipe will be about 18 inches below ground surface. Allow for a 6-in. layer of gravel as a base for the pipe. Cover top half of each open joint between field tiles with tarpaper or composition roofing to prevent earth from sifting into pipe. Then fill in trench. Cover field with lawn or pasture (grass or clover); never use for vegetables or grain crops.

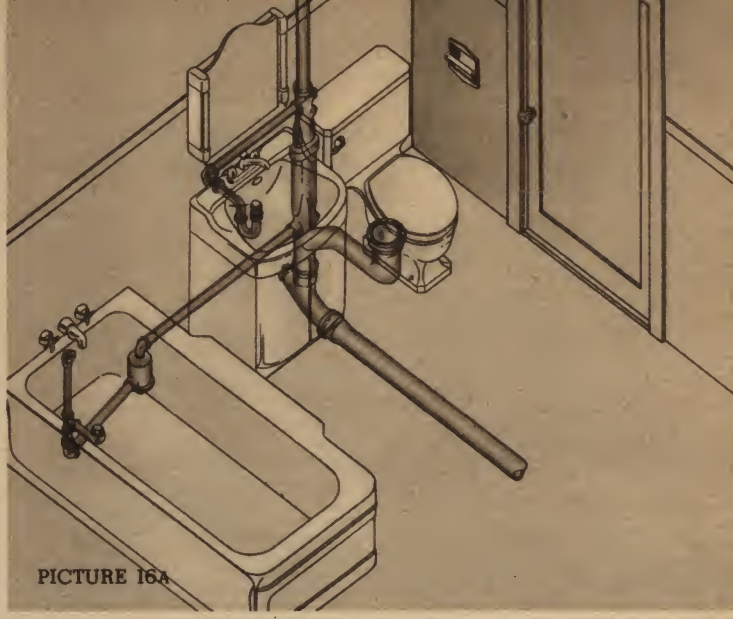
If large amounts of grease are to drain into kitchen sink, install a grease trap in sink waste line. Indoor type (C, Picture 12) is placed under sink or in basement. Outdoor type (D) is installed underground, beyond foundation wall and connected by soil pipe to sewer line. If sink has a garbage disposer, do not use a grease trap.

Picture 14 shows a typical septic tank system. Wastes flow through soil stack (5), house drain and house sewer (6) to septic tank (7).

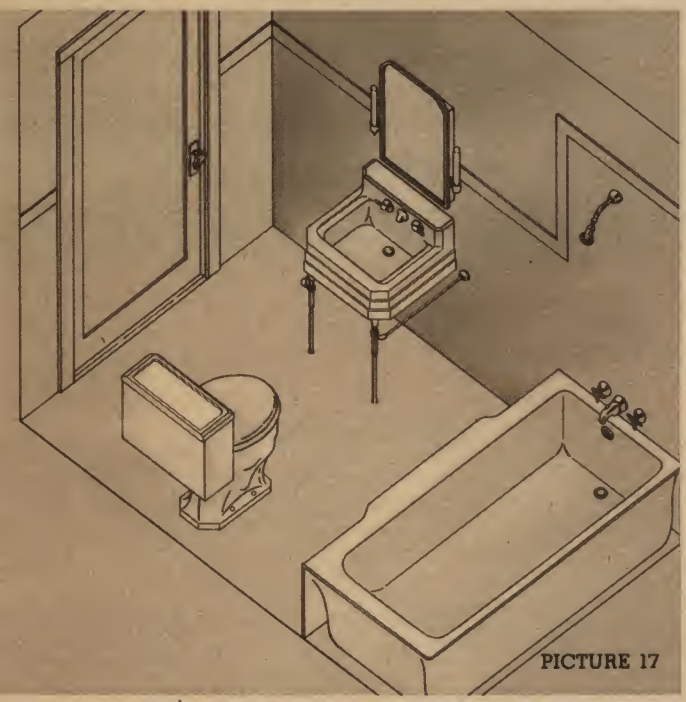
Separate waste stack (8) is used for kitchen sink. Wastes reach grease trap (9) and continue through pipe (10) which connects to sewer line at (11). Liquid discharged from septic tank reaches drain field (12) through line (13).



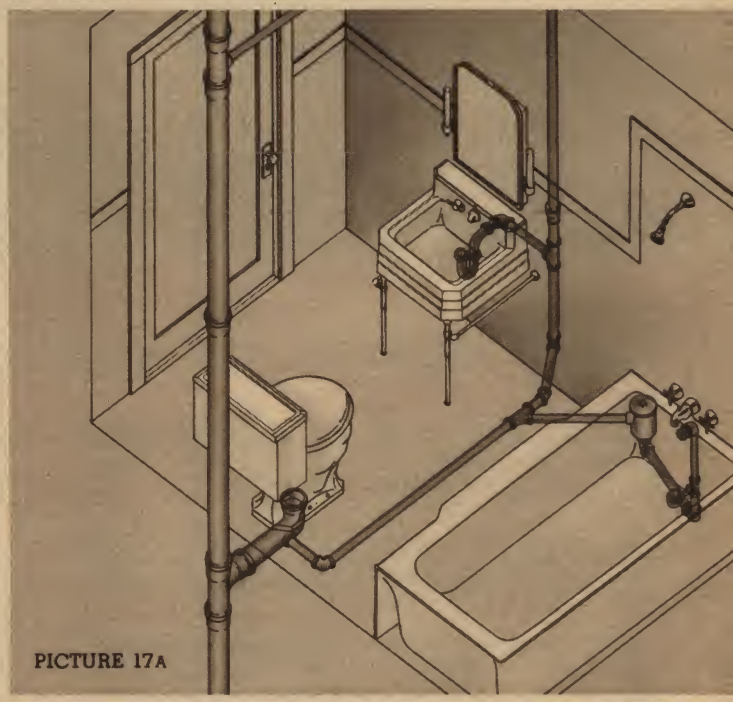
PICTURE 16



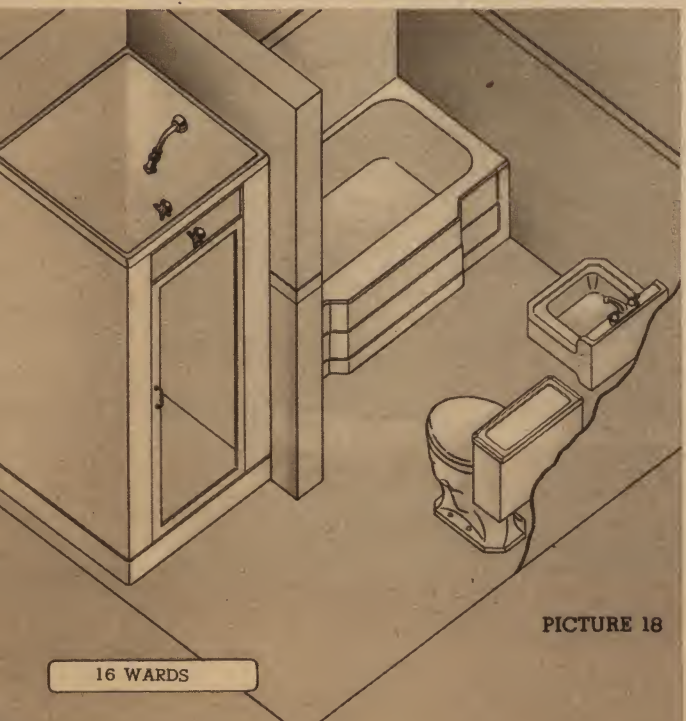
PICTURE 16A



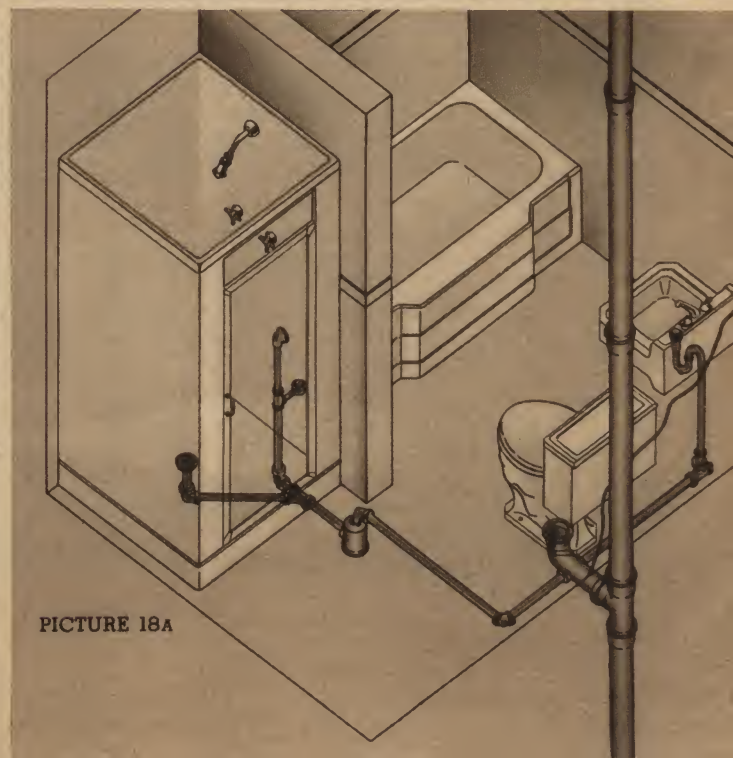
PICTURE 17



PICTURE 17A



PICTURE 18



PICTURE 18A

PLAN BATHROOMS FOR CONVENIENCE

A complete bathroom can be installed in a space as small as 25 square feet, floor space (5 ft. by 5 ft.). Larger space is highly desirable, however.

Plan space according to needs. If bathroom is to be used as a dressing room, allow for dressing table, chair, etc. Avoid, however, using too large a space. A smaller bathroom requires less piping; less material to cover walls and floor; is easier to heat and keep clean.

In an old house, space for a bathroom must be found. A remodeled pantry can sometimes be used if size is adequate. (It may be necessary to re-locate the door.) Articles formerly stored there can be moved to modern, more efficient floor and wall cabinets in kitchen. A large closet or store room, or space beneath stairs which is wasted or used for storage often can be adapted. In some houses the end of a hall is partitioned off. Older houses often have large bedrooms. A partition or two may suffice to make such a room over into a bathroom and smaller bedroom.

Where no suitable space is available, a small addition to building may be necessary. In such case, it is best to lay a complete foundation for bathroom to keep floor warm and protect any underfloor pipes.

In large houses without central heating, portions are often closed off during winter. In such case, be sure bathroom opens to a room or hall that is heated all winter.

Several factors affecting cost should be considered. If bathroom will be on first floor, try to locate so that it will have a common wall with kitchen. This makes it possible to group fixtures so that minimum plumbing material and labor are required. Often permits use of simplified plumbing system described on Pages 12 and 13. If there is to be a second floor bathroom, savings can be made by installing it directly over kitchen, or over first floor bathroom, so same stack can serve both.

Along with location of bathroom, consider placing of fixtures. Compact fixture arrangements, by reducing length of hot water lines, decrease heat loss and hot water flows more quickly at faucets, with less water waste. Consider all possible plans from the point of view of best use of space, convenience and economy of installation.

Opposite page shows three fixture arrangements with corresponding waste and vent pipe connections. Pictures 16 and 16A show simplest, most economical arrangement.

Notice that soil stack and waste pipes for all fixtures are located in the same wall. With fixtures grouped and drained in this manner, individual venting of fixtures is not necessary unless required by local code. This arrangement also permits use of simplified system as shown.

Pictures 17 and 17A show arrangement of fixtures in minimum space—5 by 5 feet. Bathtub is placed on one wall; closet and lavatory on opposite walls. Because of limited space, door opening into bathroom would not clear fixtures. Plan door to open out between closet and lavatory.

Pictures 18 and 18A show one of many arrangements where fixtures are placed on separate walls. A shower stall adds convenience. Partition between tub and shower contains waste and supply pipes serving both fixtures.

It is usually best to have only one door entering bathroom. Unless separate bathroom is planned for each bedroom, door should open into hall or other common room for convenient access at all times.

Bathroom should have a window for light and ventilation. Room will stay warmer, however, with only one window—up to 5 feet above floor. If possible, place at right angles to lavatory for best light. If impractical to put in window, install a ventilator to open air.

Various accessories add convenience to bathroom. Install a medicine cabinet with mirror, over lavatory. Plan to include soap dishes, towel bars, toothbrush holders, toilet paper holder, hooks for clothing, etc.

Provide adequate light and heat. Best place for electric light is above or on each side of medicine cabinet. If house has no central heating, gas or electric wall heater will prove desirable. An electric outlet is recommended for curling irons, heaters, electric shavers, etc.

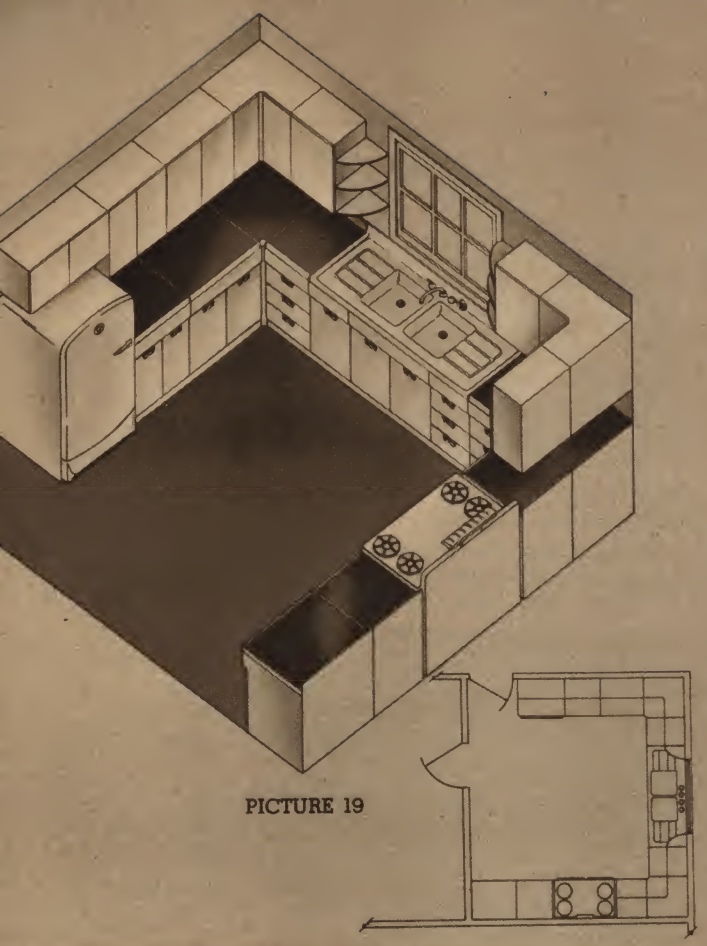
A shower may be installed with spray head over tub (Picture 17) by using tub-shower combination fitting. This consists of a shower head with extension pipe connected to tub spout or spout supply pipe inside wall. By a simple diverter valve the user controls water flow into tub through spout or through shower head. Single set of handles controls water for both tub spout and shower head.

Separate shower stall (Picture 18) can be installed in bathroom either with or without tub. If house has a second bathroom, install a shower stall instead of a tub in one of the bathrooms. In addition, an extra cabinet shower in basement or utility room is convenient for cleaning up after a dirty job in yard or house. Shower cabinet requires floor area only 3 feet square.

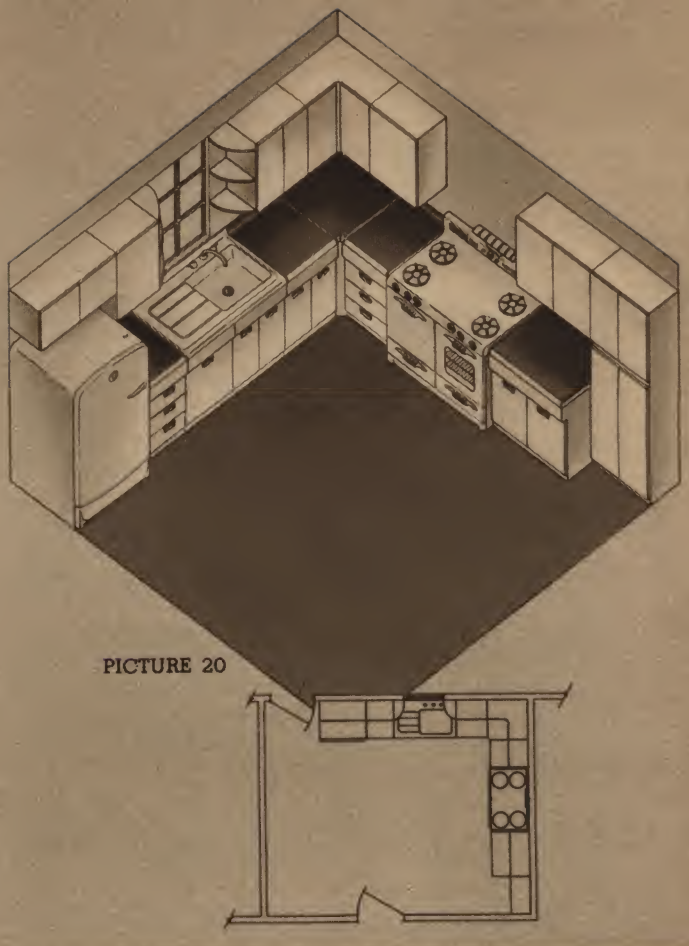
Finishes for bathroom walls, floors and ceilings should be durable and resistant to water and vapor. High grade, moisture-resistant gloss enamel is economical for walls and ceilings. Moisture-resistant tile board and enameled covering are moderately inexpensive.

Tile for walls comes in several types. Vitreous tile is excellent but expensive. Newer, lower-cost tiles are made from enameled aluminum, steel and tempered pressed wood and plastics. Structural glass and glass brick are excellent but expensive. Waterproof wallpaper may be used on upper wall but should not be used near tub or shower. For the floor, ceramic, asphalt, rubber or vinyl tile or linoleum makes a durable, easy-to-clean covering. Smooth cement may be used for economy and covered later on. Ceilings are usually gloss enameled.

In addition to regular bathroom, a half-bathroom or powder room is desirable, especially for a large family or in a two-story house with full bathroom upstairs. On the first floor it is convenient for guests and saves time and steps for members of family. Half-bathroom contains lavatory and closet; requires only 3 by 5 feet of space. Powder room has lavatory, closet, dressing table and chair. Either should have a mirror. Pantry, closet or space under stairs can be remodeled. Closet cannot be installed in basement unless house drain is under basement floor. For economy select space near soil stack.



PICTURE 19



PICTURE 20

WELL PLANNED KITCHEN AND UTILITY

Handling food in the home involves separate operations which usually follow this sequence: (a) storing, (b) preparing, (c) cooking and (d) serving. Logical kitchen planning is based upon these operations and divides the kitchen into three major work areas—each with its special appliances and equipment.

Near the door where food is brought into the house there should be: (A) refrigerator of generous size; (B) floor and wall cabinets for storing canned goods, cereals, sugar, and other staples and fruit and vegetables with low perishability.

Food is made ready for cooking in the preparation area, adjoining the storing area. It includes the sink where most preparation takes place. Here fruit and vegetables are washed, cut and placed in utensils for cooking. There should be plenty of adjoining counter surface for mixing batters, making salads, etc. Cabinets on floor and wall and under sink provide storage space for pans, appliances, cutlery and preparation tools. As dishwashing is done at sink, soap, cleansers, towels, and refuse containers should have space there.

The third work area is where food is cooked and prepared for serving. It should be near dining area to save steps in carrying food to table. The stove, of course, is the principal equipment here. There should also be cabinets for cooking tools, dishes, glassware and serving dishes. Counter or table space near stove makes it easier to transfer food from cooking utensils to serving dishes and provides work space for those food preparations that follow cooking.

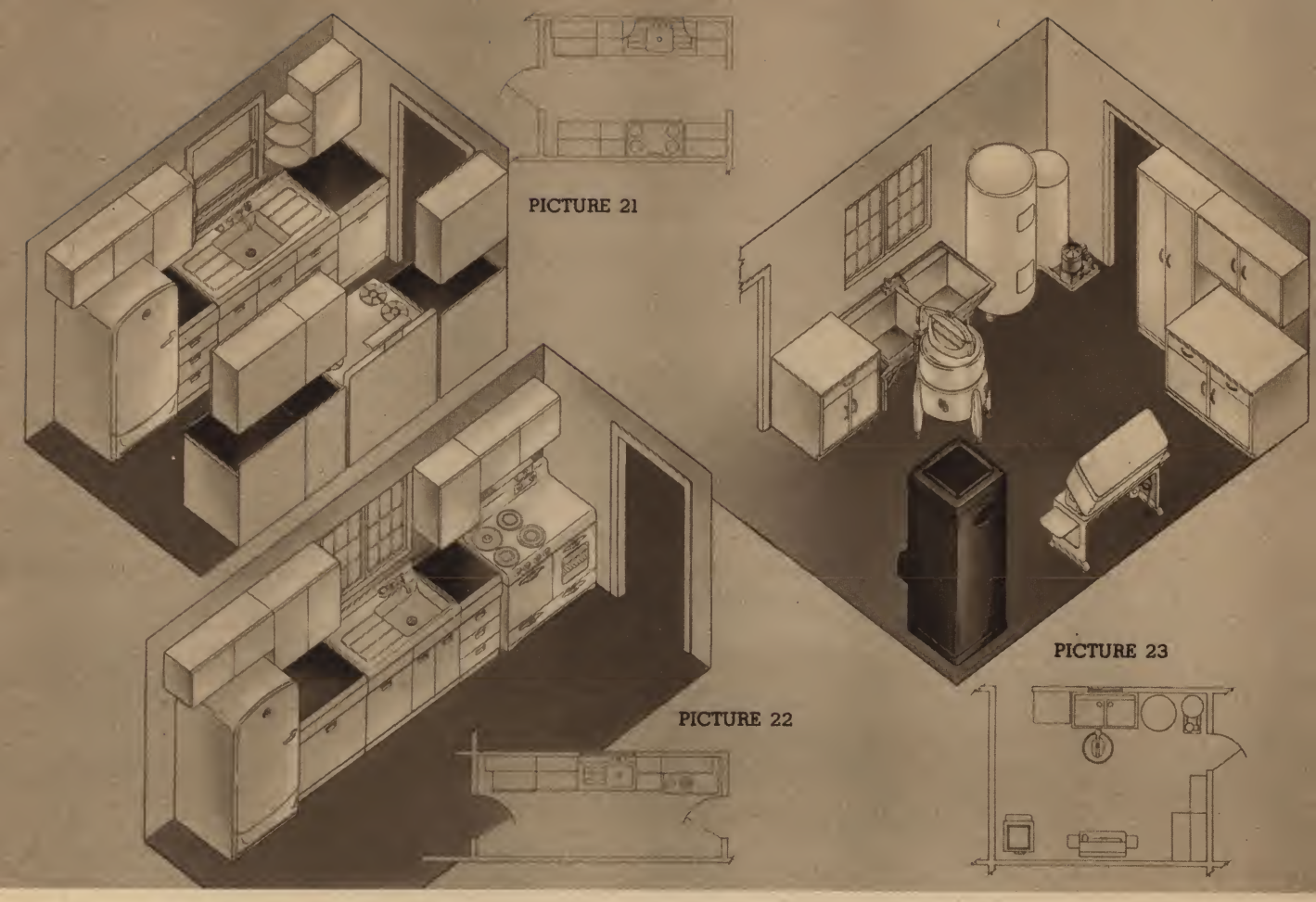
Work areas should always be arranged in the order indicated, for greater efficiency. Size and layout of each work center, however, is controlled partly by shape of room, location of doors and windows and similar factors.

Most kitchen arrangements can be classified as U-type, L-type or Corridor type. Picture 19 above shows typical U-shape where working areas are located on three adjoining walls. Room suitable for this type kitchen is approximately square. It is best to keep U-type small to save steps in walking back and forth. This is a highly efficient arrangement, if properly planned—it is similar in principle to production layouts used in many industries to save work and time. L-type (Picture 20) uses two adjoining walls only. The corridor type kitchen is narrow with door at each end. Equipment is arranged either on opposite walls (Picture 21) or all on one wall (Picture 22).

Floor and wall cabinets may be custom-built or factory made. Excellent ready-made cabinets of steel and wood are available in various sizes and types. Work counters on floor cabinets may be porcelain enamel, linoleum or one of the newer plastics such as durable Vinyl which is non-crazing; resistant to common household acids, grease, soap, cleansers, etc.

Wards new design steel cabinets (shown in kitchens above) are sanitary, verminproof and quiet. Rigidly constructed, they may be used individually or in groups to fit any size and shape of kitchen. Rounded corners and recessed pulls leave no sharp edges to cause bruises or tear clothing. Perfectly match Wards new design all-steel cabinet sinks.

Home- or custom-built sink cabinet may be fitted with either of two types of top: (1) Linoleum-covered wood drainboards, with flat-rim porcelain enameled steel or cast-iron



ROOM SAVE STEPS...MAKE WORK EASIER

sink basin; (2) drainboards, basins and splash-back of one-piece porcelain enameled steel or cast iron.

Give careful attention to such details as lighting, wiring, ventilating fans, food freezers, automatic dishwashers, garbage disposer units, etc. All work areas should be well lighted by either a ceiling fixture or individual fixtures over work spaces, or a combination. As most kitchen work centers around sink, locate it under or near window for best natural light. Provide plenty of electrical outlets conveniently located for refrigerator, mixer, toaster, waffle iron, coffee maker, clock, etc.

A ventilating fan carries away odors and hot air; makes kitchen cooler, keeps odors out of other rooms. In house without utility room or basement, washing machine and water heater are often located in kitchen.

An electric garbage disposer may be installed under sink. It grinds most kitchen wastes (including bones) into small particles and discharges them into sink drain. Convenient and sanitary. (See Page 31 for connections.)

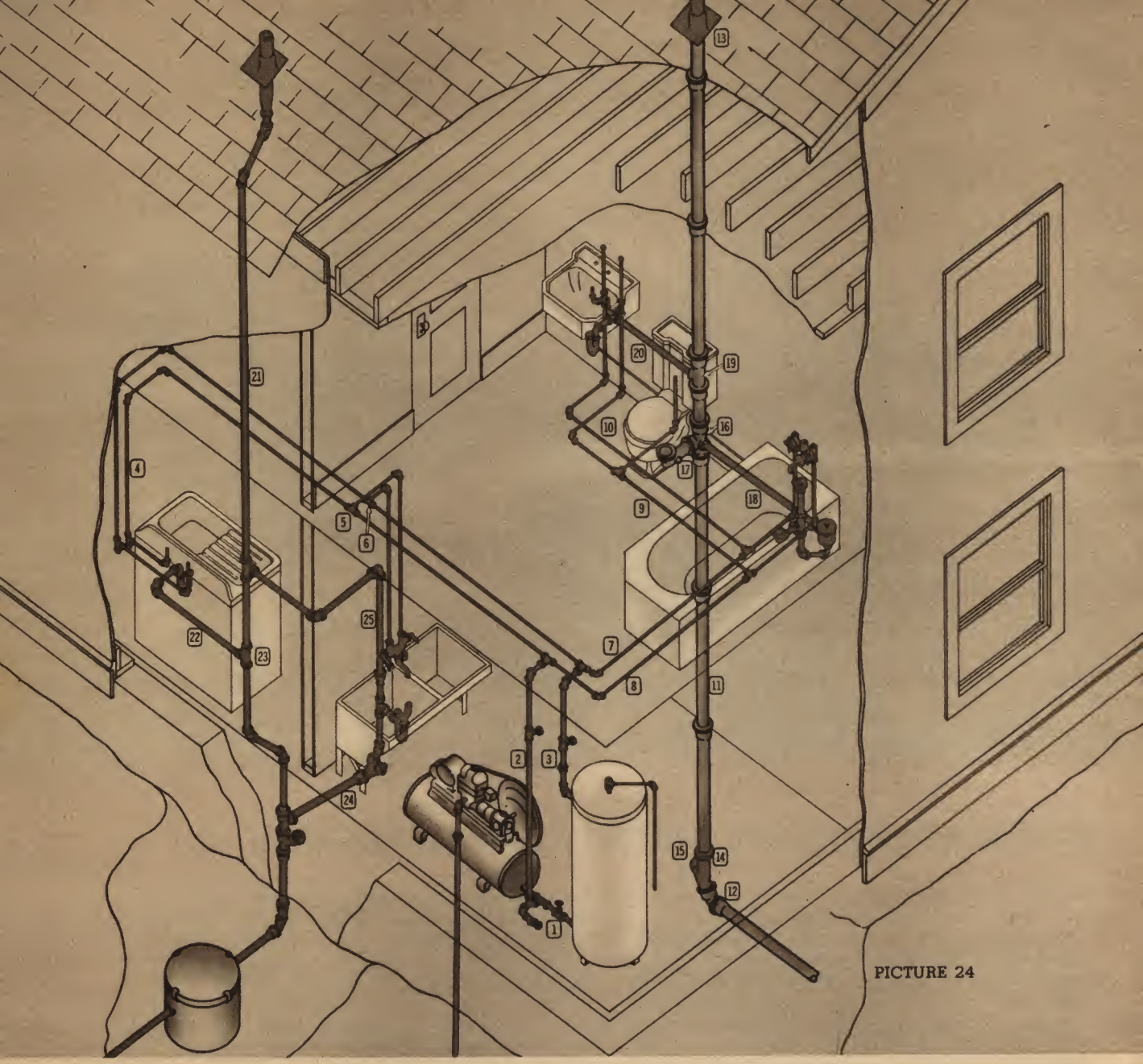
Floor and wall treatment depends largely upon individual taste. Walls may be finished with tileboard, tile, washable paper, enamel, linoleum or oil cloth. Gloss or semi-gloss enamel is the most common wall finish because it is washable, durable and economical—and the color scheme can be changed at moderate cost. Linoleum is most commonly used to cover floor. It is durable, water-resistant, easy to keep clean, and resilient to walk upon. Various other floor coverings of similar properties, especially Vinyl, asphalt and rubber tiles, are increasing in popularity.

Plumbing necessary for kitchen sink includes hot and cold water supply pipes, waste pipes and a suitable trap. If kitchen and bathroom are back to back on first floor and soil stack is not more than 5 feet from sink trap, additional venting of sink trap is not necessary. If bathroom is directly above kitchen, waste pipe from sink can empty into stack but separate vent pipe must extend from sink drain pipe to point of stack above highest discharge connection of upstairs fixtures. Where kitchen sink is too far from soil stack, use a separate waste stack.

If you have a cistern, you can deliver this soft water to laundry tub (or sink used for laundering) with a separate system of pump, supply pipes and faucets. A small, automatic shallow well pump for this purpose can be placed in basement, utility room or kitchen. There should *never* be a direct connection between pipes carrying untreated cistern water and pipes carrying drinking water.

A modern house should have either a basement or utility room or space in the kitchen for mechanical equipment such as heating plant, washing machine, ironer, frozen food locker, etc. If an individual water system is used it is usually located there. A basement provides generous space and easy access to plumbing and heating systems. Utility rooms on the ground floor (Picture 23) are finding favor today with many home builders. A well-arranged utility room saves steps and time. Extra space in basement or utility room is often used for work shop, hobbies, recreation.

Water service from city mains or private pump usually enters house through basement or utility room, where water must be supplied to water heaters, softeners, laundry tubs, washing machines and heating boiler if there is one.



PICTURE 24

TYPICAL COMPLETE SYSTEMS SHOWING

House in Picture 24 has no basement, so equipment usually located there is installed in first floor utility room.

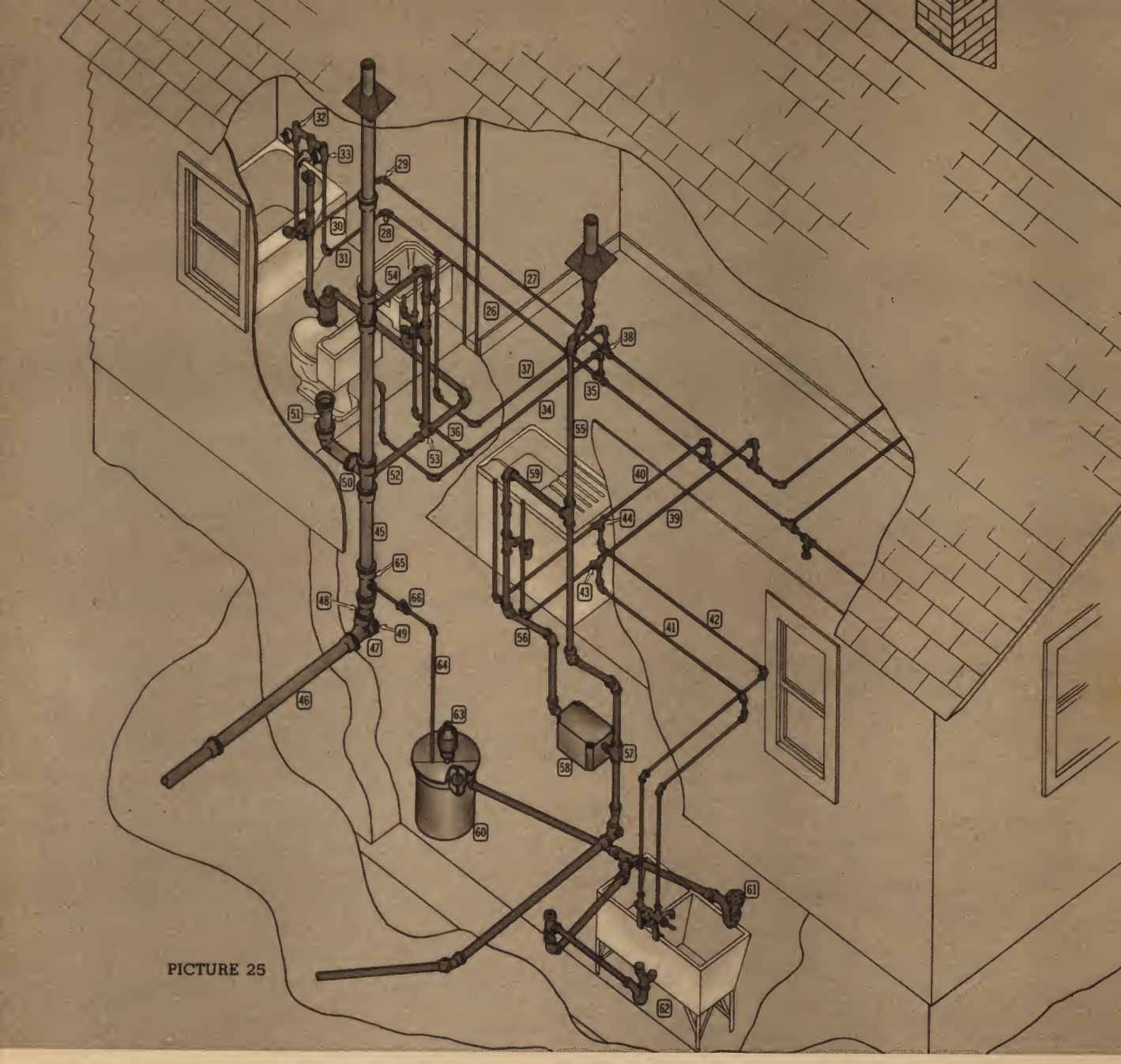
Water, in this case, is supplied to fixtures by an automatic electric pump with pneumatic tank. Cold water reaches water heater through pipe (1) connected to discharge tapping of pneumatic tank. Pipe (2) carries cold water to mains beneath second floor. Pipe (3) from water heater supplies hot water lines which align with cold water lines throughout system. At (4), pipes drop to supply kitchen sink with hot and cold water. Laundry tub is supplied by pipes connected to mains at tees (5) and (6). Lines (7) and (8) supply bathtub. Pipes (9) and (10) connect to bathtub supplies and carry water to closet and lavatory.

All bathroom fixtures drain into soil stack (11) which extends from house drain (12) through roof. Flashing (13) provides watertight roof seal. Stack base consists of one ⅛ bend and one sanitary Y (14) with cleanout (15).

Sanitary tee (16) receives closet bend (17) and bathtub waste (18) at its side tapping. Tee (19) receives waste pipe (20) from lavatory. All bathroom fixtures are within 5 feet of stack and vent directly to it.

As laundry tub and sink are some distance from soil stack, separate waste stack (21) is needed. Sink drains through waste pipe (22)—joining stack at tee (23). Laundry tub drains through pipe (24). Pipe (25) vents laundry tub trap to upper part of waste stack which also vents sink.

In one story house (Picture 25), supply mains (26) and (27) are suspended from basement ceiling. They extend to elbows (28) and (29) opposite end of recessed bathtub. Short pipes (30) and (31) run to partition. Vertical pipes supply hot and cold water to bathtub faucets (32) and (33).



PICTURE 25

DRAINAGE AND WATER DISTRIBUTION

Pipe (34) takes off from cold water main at tee (35) to supply closet tank. Pipe (36) supplies cold water to lavatory. Hot water arrives at lavatory through pipe (37) which connects to hot water main at tee (38).

Fixture branches (39) and (40) carry hot and cold water to kitchen sink. Laundry tub is supplied through pipes (41) and (42) which connect to tees (43) and (44).

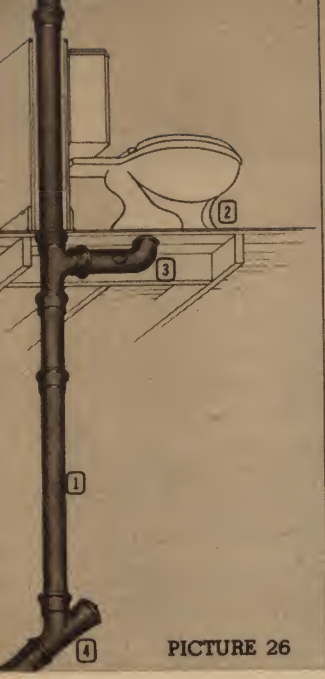
Soil stack (45) extends through roof from its base connection to house drain (46). Stack base is formed by a sanitary Y (47) and ⅛ bend (48). Cleanout plug (49) screws into end of Y.

Closet bend joins stack at sanitary tee (50). Short length of soil pipe (51) is used in this case to drop closet bend beneath joist in basement. Side opening of tee receives drain (52) from bathtub and lavatory. Lavatory drain connects to drainage tee (53) in bathtub drain line. Pipe (54) vents lavatory to soil stack.

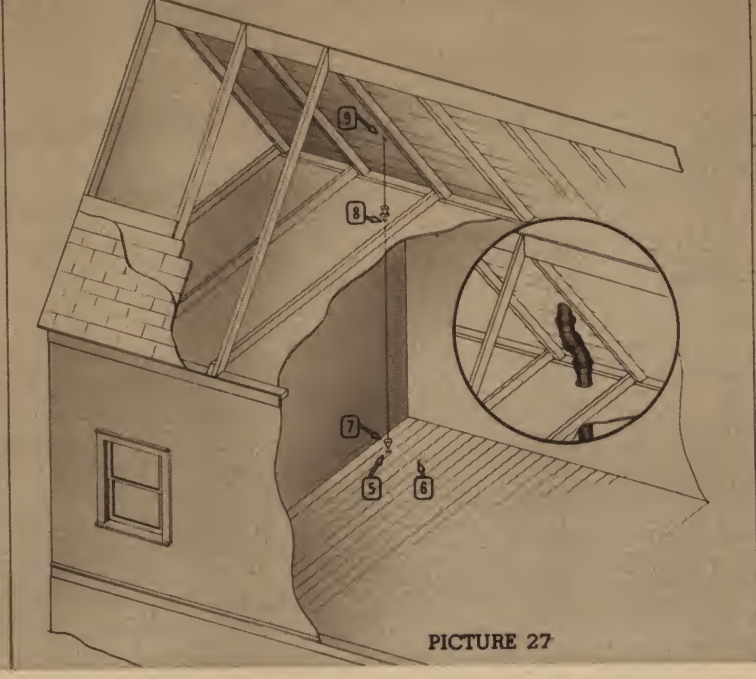
Separate waste stack (55) serves sink. Sink wastes into pipe (56) which connects to stack at drainage tee (57). Grease trap (58) is inserted in sink waste line. Pipe (59) vents sink to stack.

As house drain (46) leaves building above basement floor (often the case where a septic tank is used), a sump (60) in basement floor collects wastes from basement drain (61) and laundry tub (62). For disposal, these wastes must be raised from sump to level of house drain. An automatic cellar or sump pump (63) is used for this purpose.

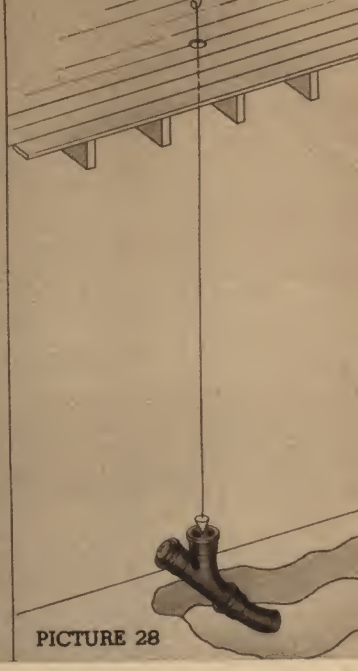
Pump starts when wastes reach pre-determined height in sump and stops when sump is drained. Wastes are discharged through pipe (64) to tapped tee (65) in stack. When pump stops, check valve (66) closes to prevent any wastes in stack from backing through pipe (64) to sump.



PICTURE 26



PICTURE 27


PICTURE 28

NOW, FOLLOW THESE STEPS

STEP 1. CONSIDER THE FIXTURES. The Fixtures selected and their locations determine the layout of plumbing system. Either have fixtures on hand or know their exact measurements so waste and supply connections can be placed accurately. (Check Wards Catalog and instruction sheets for essential measurements of Ward merchandise.)

STEP 2. ARRANGE PLUMBING TO SERVE THESE FIXTURES. Plans for the entire system should be laid out on paper for a clear, overall picture. Often a simple sketch will do. However, partition and room sizes; pipe locations, lengths and sizes; fittings, connections; fixture dimensions and locations should be clearly indicated.

Consider the soil stack—water closet and house drain combination (Picture 26)—first, as it forms the basic house plumbing unit and requires careful planning. Stack (1) and closet (2) should be close together for easy connection of closet bend (3). Position of house drain, in turn, is governed by location of stack base (4).

Distance from *center* of closet bend hole to *finished* wall is called *rough-in*—a minimum of 12 in. for most modern closets (check your closet). Conventional 15½-in. bend adjusts for any rough-in up to 15 in. Simplified system bend (Page 12) does not adjust; takes any rough-in up to 13½ in. Minimum rough-in places closet tank against wall; add 1 or 2 in. if tank is to stand slightly out.

Take advantage of any conditions that will make installation easier. If house has a partial basement, try to locate stack base there for easier connection to house drain.

Concealing stack within partitions is simple in new construction. Partitions are properly sized, and stack may be put in as soon as framing is erected.

When adding plumbing to an older house, however, original partitions may be too small. In such cases, additional 2- by 4-in. studding may be used to fur out partitions as required to cover stack. If water closet is near corner, stack may be installed there and covered by furring across corner. Or stack may be concealed in an adjoining storage closet or pantry. It may be necessary to select a different water closet location as a compromise for better stack location. Simplified system (Pages 12 and 13) with 2-in. vent, will fit into a standard 2- by 4-in. stud position.

In a two-story house, stack must line up exactly on both floors—it should not be offset below any fixture waste. Also, stack must avoid doors, heating ducts, electric wiring.

After locating stack and closet, consider the house drain. This drain connects to base of stack and extends horizontally about 5 feet beyond foundation wall—at which point it joins house sewer. If house has no basement, drain runs in space beneath house. In basement, it may be suspended from ceiling (usually the case with septic tank) or run under basement floor. Consider location of septic tank (or city sewer) at this time so direction of house drain and house sewer can be determined.

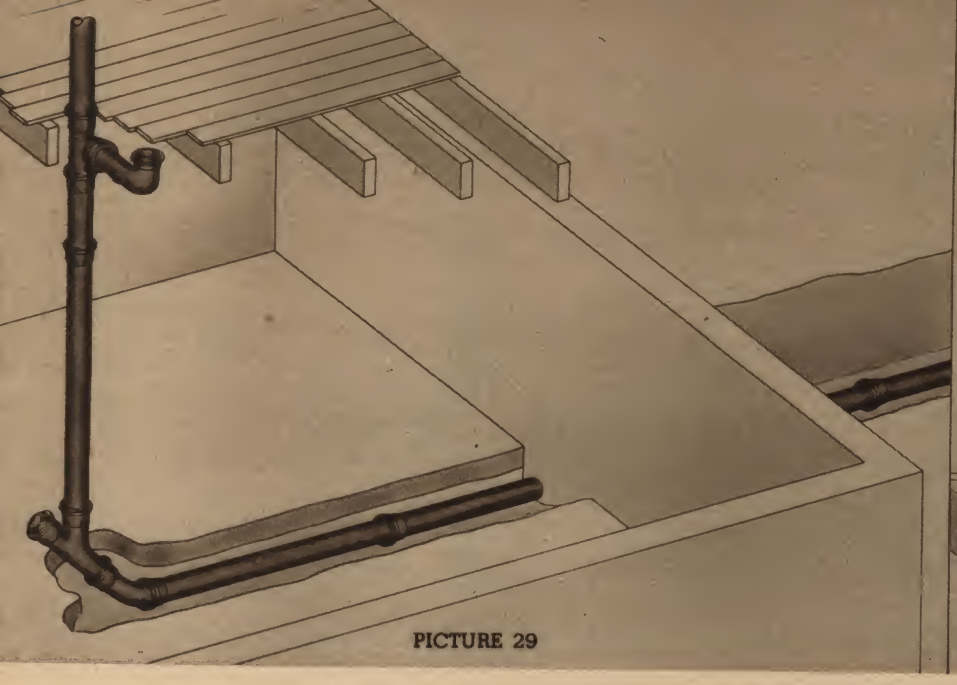
Decide whether or not additional stacks are necessary. A separate waste stack for sink or laundry tub may be extended through roof or up to attic space and then run across to soil stack. A horizontal soil pipe branch connects base of separate soil or waste stack with house drain.

Plan waste system with proper vents and traps. Grade all horizontal waste pipes in direction of flow—¼-in. per foot. Horizontal runs of vent pipe should also be graded slightly to permit condensation moisture to drain away.

Next consider water supply. If beyond city mains, select a private system of proper size and type. Write to nearest Ward Mail Order House for a free copy of booklet, "Running Water for Farm and Country Home."

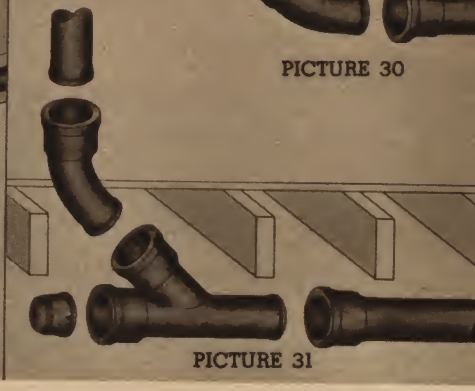
STEP 3. MAKE PRELIMINARY TESTS AND MEASUREMENTS. Before cutting walls or floors in a finished house, some testing should be done to determine if soil stack and fixtures can be installed as planned. Check fixtures to be sure they will fit space. Then measure to where waste and supply pipes must come through wall or floor to meet fixtures, and mark these points. If fixtures are on hand, assemble brass trim to get measurements for pipe connections.

Drive a nail through first floor at center point of planned stack location (5, Picture 27) and—if bathroom is on first floor—another in center of closet outlet location (6). Find



PICTURE 29

PICTURE 30



PICTURE 31

IN INSTALLING YOUR SYSTEM

where nails come through in the basement or crawl-space under house, and determine if stack and closet bend will clear joists and beams. If not, decide whether their locations may be shifted, or if joists or beam must be cut. Where bathroom is on second floor, it may be necessary to remove some flooring to locate joists. To find where stack will pass through first floor ceiling, suspend a plumb bob (7) so that it hangs over center of nail head in floor. Mark ceiling and, using a bit brace and ¼- by 18-in. *electrician's* or *feeler* bit, bore a small hole through first floor ceiling at point indicated. Then suspend plumb bob over center of this hole (8) from room or attic space above. This determines point (9) where stack will pass through upstairs ceiling or roof. If there is a second or third story, repeat for each. If stack cannot go straight through roof due to dormer or other obstruction, or because too close to eave, offset with two ⅛ bends (and pipe if necessary). See inset, Picture 27.

Return to first floor and take up floor boards around stack area or cut circular opening where stack will pass through floor. If stack will be in partition, cut away enough wall to allow installation.

Drop a plumb line (Picture 28) from exact center of first floor opening to ground or basement floor to find where stack base will be connected to house drain. Trace on floor or ground where drain must run for shortest, straight-line between stack base and septic tank or city sewer. (Don't run house drain under basement floor if it would require burying septic tank too deeply.)

STEP 4. PREPARE TRENCH FOR HOUSE DRAIN AND STACK BASE. Unless suspended from basement ceiling, stack base and house drain require an installation trench. If under basement floor (Picture 29), break a 12 to 14 inch strip in concrete being careful not to cut or crack any more floor than necessary. Then dig just deep enough so that house drain will rest about 8 inches below floor at stack base and slope down at least ¼ inch per foot toward city sewer (or septic tank). Determine at this time where floor drains or soil branches will connect to house drain.

If house has no basement, start a trench outside where house drain will join house sewer and dig toward house. Continue trench to point under house where drain connects to soil stack. Also, dig trenches for any connecting drains and branches. (Injury may result from trenches caving in. Be careful; use cross braces to keep upper earth in place.)

When trench is completed, check for proper grade and tamp bottom so ground will be packed. If soil is not firm, use bricks or stones to give pipe a solid base.

STEP 5. INSTALL STACK BASE. Base is usually made up of one 45° Y-branch and one ⅛th bend. If bend is calked to house drain and Y-branch into bend, cleanout will be at 45° angle as shown in Picture 30. This arrangement is used where drain is underground. By reversing order and calking Y-branch to drain (Picture 31), cleanout will be horizontal and easier to get to where house drain is suspended from basement ceiling. Cleanout ferrule with threaded brass cleanout plug is calked into hub of Y-branch.

When calking stack base fittings together, also calk in a length of soil pipe for start of house drain. Use care in lining up the fittings to be sure the hub for vertical stack is level and horizontal house drain length has a slight downward pitch. After calking joints, place stack base assembly in trench, being careful to have plumb line exactly in center of hub for stack. Support assembly on hard clay, stones or bricks at correct elevation, and tamp soil around base to hold it temporarily in position. For suspended drain, hang stack base with iron or wood hangers or heavy chain so that hub receiving stack is centered exactly where stack must rise through house.

STEP 6. INSTALL HOUSE DRAIN. Begin outside where house sewer will start and work back toward stack base. Construct of 4-in. cast iron soil pipe or 4-in. vitrified tile pipe. (Check local code.)

If using tile, place a thin strand of oakum in each hub and press correct portland cement mix into and entirely around joint. Swab inside of joint to remove excess cement

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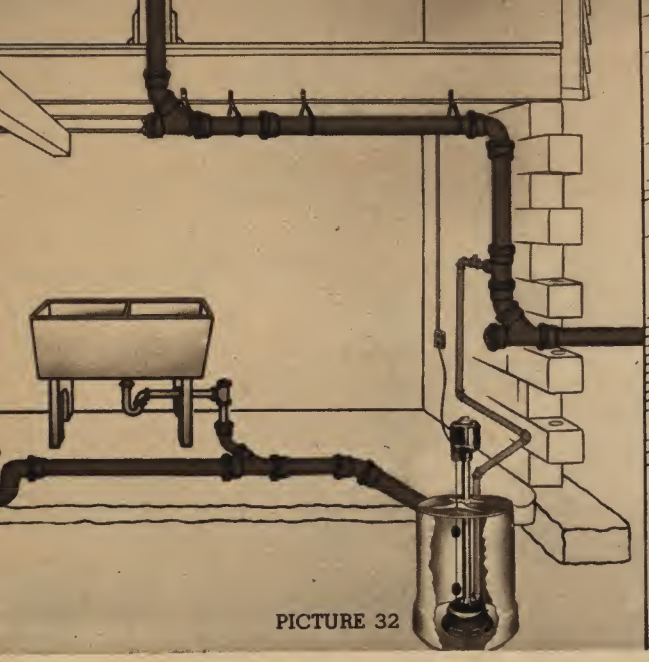
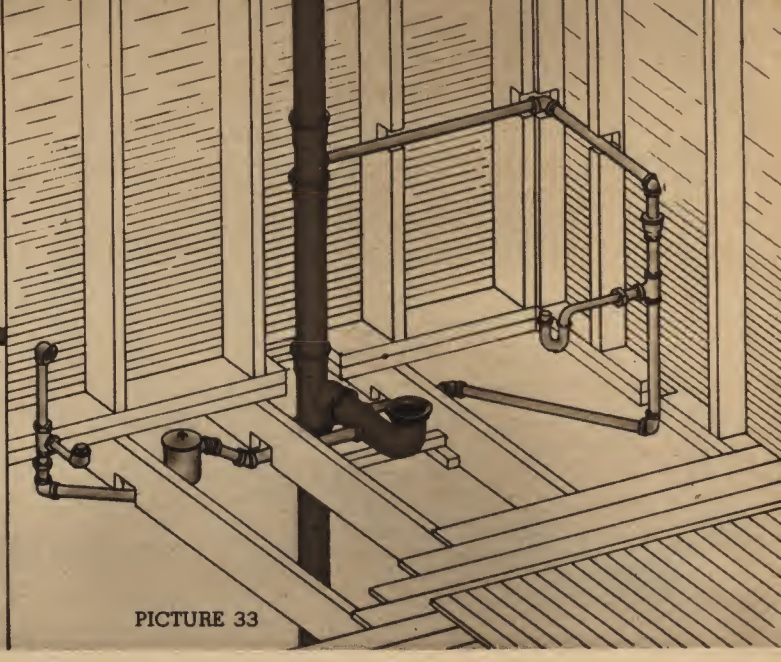


PICTURE 32



PICTURE 33

MAKE ALL JOINTS TIGHT; TAKE

which might cause stoppage. If cast iron soil pipe is used, it is easier and faster to calk two or three lengths of pipe together and lower into trench as a unit. Location of fittings to receive branch pipes from separate waste stack, laundry tub, floor drain, etc. must be figured beforehand and calked or cemented in proper position.

Placing last piece of soil pipe or tile requires sliding the stack base assembly backward about 2½ inches and forward again so last spigot and hub joint can be formed. After completing house drain, lay and connect branch drains.

If desirable to have drain leave building above basement floor (to avoid burying septic tank deeply) suspend drain from basement ceiling. Then direct it down near foundation wall so it will leave house 12 to 24 in. below ground surface (Picture 32): Construct suspended drain of cast iron soil pipe. This requires strong support from joists or beams—usually with iron or wood hangers or chain. Complete drain by assembling and calking convenient sections on basement floor before suspending in position.

An automatic *sump pump* is used with suspended drain to lift basement wastes from floor drains, laundry tubs, etc. Hook-up of sump pump is shown in Picture 32.

STEP 7. INSTALL STACK. With stack base and house drain permanently in position, begin work on stack itself. If house has basement of average height, set a full 5-ft. length of soil pipe into stack base hub. Make sure that pipe is plumb; then calk joint.

Now check distance between hole made for stack and position marked for center of closet outlet in first floor bathroom. Cut hole for closet bend to meet this outlet. (Check instructions with closet.)

Connection between closet and stack is made using a sanitary tee fitting in the stack and a closet bend calked into side inlet of tee. (Closet bend must be 4-in. diam. If stack is 3-in. diam., use a 3- by 3- by 4-in. tee.) Frequently a few inches must be cut from length of closet bend. This can be determined by loosely assembling bend and tee and comparing the measurement from center of bend opening to center of tee with the distance on floor from center of hole for closet to center of hole for stack.

When proper length, calk the closet bend into the tee and set the assembly in exact position at same elevation as for the completed job. Top of closet bend should be ½ to ¾ inch below finished floor level. Support this assembly with iron or wood hanger fastened to joists.

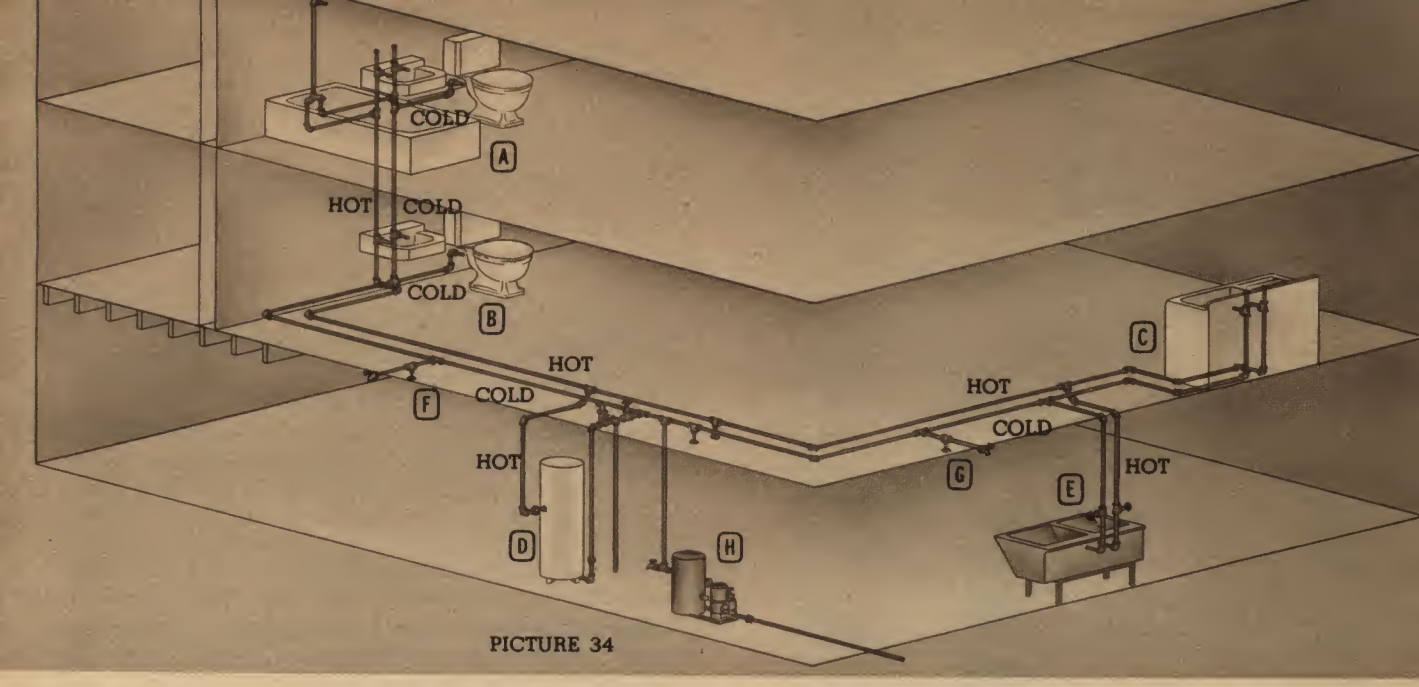
Measure and cut a piece of soil pipe to connect lower end of sanitary tee with hub of the stack pipe previously set in stack base in basement. Insert pipe and calk joints.

If stack base is suspended from basement ceiling or house does not have basement, a full length of soil pipe cannot be calked into stack base hub. Under these conditions, place closet bend and sanitary tee in position first—then measure and cut soil pipe to needed length for joining stack base hub and sanitary tee receiving closet bend. If house has second floor bathroom only, begin stack at top hub of stack base and continue to second floor where sanitary tee with closet bend is calked into stack. Be sure to include fittings needed in stack to receive waste pipes from first floor fixtures.

Remainder of stack may now be installed beginning at hub on top of sanitary tee. Calk in successive lengths of soil pipe, each to hub of preceding length—be sure to cut pipe to proper lengths so stack fittings for drain and vent lines can be calked into position.

If there is another bathroom on second floor, proceed as for first floor bathroom. Build stack up to second floor, and calk in tee with closet bend at proper elevation. When roof is reached, cut hole for stack and extend at least one foot above roof opening. If 2-in. pipe is used for stack (as for simplified system) increase to 4 inches at roof to prevent *frost closure* caused by moisture condensing and freezing inside stack. Use a 2- by 4-in. increaser fitting. The 2-in. end is tapped for screwing to threads on top of 2-in. stack just below roof opening.

Flashing seals roof opening around stack (or increaser). Slide flashing over soil pipe stack (or increaser) and an-



PICTURE 34

ALL MEASUREMENTS CAREFULLY

chor firmly under shingles. Hammer lead on flashing snugly around stack (or increaser). Work mastic roofing compound around joint.

STEP 8. INSTALL WASTE AND VENT PIPES. Assembling these pipes (Picture 33) involves the following:

1. Selecting proper size pipe (Pages 6 and 7).
2. Cutting pipe to fit installation (Page 26).
3. Using proper fittings and making clean, tight joints.
4. Sloping pipe toward stack at rate of ¼-in. per foot of length so wastes will flow toward stack (tappings in stack fittings are at correct angle).
5. Avoiding excessive cutting of building framing.
6. Having materials and tools on hand to do the job.

STEP 9. INSTALL SEPTIC TANK (if required). See Pages 14 and 15 for installation of septic tank and drain field.

STEP 10. INSTALL HOUSE SEWER. After digging trench for sewer, check for grade. Begin laying sewer at septic tank inlet or city sewer, and work back toward end of house drain installed earlier. (Usually a permit must be obtained to connect to city sewer—check local authorities.)

Use 4-in. cast iron pipe or 6-in. vitrified clay pipe. Lay so that hub ends point toward house. Make joints tight as leaks can be a health hazard, especially where a nearby well, spring or stream supplies water for household use.

The cement mortar for joining clay pipe is made by adding water to equal parts of portland cement and fine sand until a sticky mass is formed. To make joint, insert spigot end of a length of pipe into hub or bell of preceding length. Line up pipe for proper grade and fill hub around pipe with ring of oakum and mortar. Trowel until joint is tight and smooth. Make a swab by fastening rags to the end of a sturdy stick. Then run swab through inside of pipe and back to open end to clear away any mortar that may have entered. Joints of cast iron pipe are made by calking. To join a clay sewer line to end of cast iron house drain slip clay pipe over cast iron pipe and cement joint.

STEP 11. INSTALL WATER PIPES. Where water is obtained from city mains, consult local authorities on house service pipe. With private water supply, basement main connects to pressure tank or pump.

Picture 34 above traces hot and cold water lines in a house with full bathroom (A) on second floor, half bathroom (B) and kitchen with sink (C) on first floor. Basement equipment includes water heater (D), laundry tub (E) and two hose connections (F) and (G). Jet pump with pressure tank (H) supplies water from well.

Valves at proper locations are important for water control. Fixture supply pipes with shut-off valves permit each fixture to be cut off promptly and without affecting others. Another method is to control groups of fixtures with shut-off valves at base of risers or in basement mains.

Where it is desirable to run a water line outside of house as to garage, barn, milk house or hydrant, use galvanized steel pipe or Type K underground copper tubing. All such piping should be installed below frost line, or at least 12 inches below ground surface in mild climates. If possible, bring pipes up in interior of outbuilding to reduce freezing risk. Any pipes exposed to freezing should be fully insulated. With pump in house, provide gate valve just inside house so that supply to outbuilding may be cut off. If pump is not in house, put valve near pump. Where supplying more than one outbuilding, it is advisable to arrange piping so that supply to each can be cut off by separate valve. Be sure system has sufficient capacity.

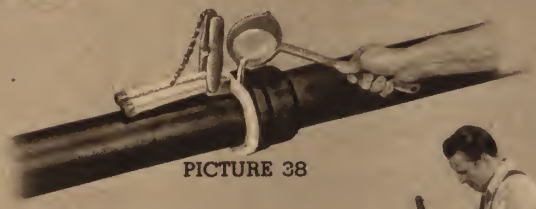
Outbuilding plumbing wastes must be disposed of. Water used for washing and cooling may be run off in drain tiles to a nearby ditch. Discharge from any water closet, however, must be piped to septic tank or city sewer for proper disposal. Water closet also requires soil stack.

Before plastering over concealed pipes, test for leaks. Test waste system before connecting house sewer to house drain; plug or cap openings in waste system; fill with water through top of soil stack; inspect each joint for leaks. To test water pipes: cap openings; connect hose to basement main; temporarily loosen cap at top outlet to let air out; let water stand in pipes; check for leaks.

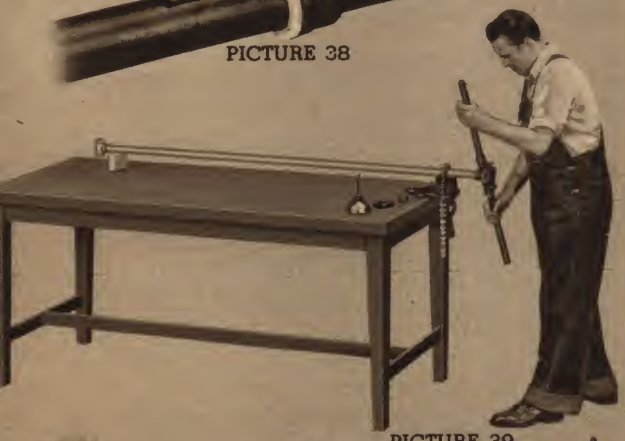
PICTURE 35

PICTURE 36

PICTURE 37

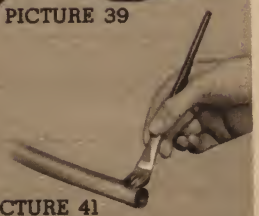


PICTURE 38



PICTURE 39

PICTURE 40



PICTURE 41

PICTURE 42

PICTURE 43

THESE PLUMBERS'

CUTTING AND JOINING CAST-IRON PIPE. Cast-iron pipe for soil stacks, house drains, sewer lines, etc., must sometimes be cut to fit installation. Tools used for this job are: (a) sharp edge file or hack saw; (b) cold chisel; (c) hammer.

After carefully measuring, mark around pipe with chalk or colored crayon where it is to be cut and make a slight groove around pipe with file or hack saw. Cut square with pipe for a clean, even break. Place a 2-by-4 (or wider) board (large side flat) on floor and lay pipe so that cut mark rests on center of board. Hold large cold chisel in groove and lightly hammer repeatedly around pipe (Picture 35).

After circling pipe two or three times, continue with somewhat harder blows until pipe breaks. Keep rotating pipe while hammering and avoid excessively heavy blows (which may cause pipe to break off unevenly). If double-hub pipe is used, each piece will have a hub for calking into line; so you get two short pieces from one pipe length. (Use same method to cut closet bend.)

Begin assembling by inserting spigot (small) end of one piece into the bell or hub of preceding lower piece. Carefully line up joint so pipe run will be straight. Tightly pack strands of oakum into joint with yarning iron (Picture 36), to about ⅔ of depth of joint. Hammer down firmly. Fill remainder of joint with molten lead at one pouring (Picture 37). Requires about 3 lbs. of lead for 3-in. diam. pipe and 4 lbs. for 4-in. pipe. Keep joint free of moisture so lead won't spatter.

After pouring lead, allow to cool a little then pound it tightly into joint, using a calking iron and hammer. Iron fits between outside of pipe and inner face of hub. Tap lightly around joint several times then, as lead becomes compact, pound with slightly more force. Use care, however, not to crack hub.

To calk a horizontal joint, clamp an asbestos joint runner tightly around pipe at joint. Lightly hammer runner against hub to prevent lead leakage. Force ends of runner flat against pipe (Picture 38) to form triangular opening between runner and pipe, into which lead is then poured to fill joint. Cut off surplus lead. Finish with calking iron as explained above.

(Lead wool may be used cold in place of molten solid lead. Pound into joint, over oakum, using calking iron and hammer. Same weight of lead wool as of molten lead is required.)

CUTTING AND JOINING STEEL PIPE. First secure pipe tightly in pipe vise, so it will not turn and strip off galvanizing. Carefully mark, and cut with pipe cutter or hack saw. If using hack saw, hold at 90° to pipe and saw with smooth, even strokes.

The burr left around inside of pipe end by cutting would seriously restrict flow through pipe. It must be removed with a pipe reamer or round file. Remove loose particles in pipe.

Pipe end must next be threaded, using pipe stock and die. Select proper die for size pipe to be threaded, and insert die into stock. Clamp pipe tightly in vise, and begin threading by pressing die firmly against end of pipe and slowly turning die stock. Keep handles at 90° to pipe and turn in clockwise direction (Picture 39). Use thread cutting oil on dies and end of pipe to assure clean threads. Continue turning until pipe end is flush with outside face of die. If longer threads are desired, make another turn or two. Remove die carefully so as not to spoil threads. Clean all chips from inside of pipe.

Join steel pipe and fittings by these threads using 1 or 2

stillson wrenches as necessary. Before screwing together, apply a good pipe joint compound to *male (outside) thread only.*

CUTTING AND JOINING COPPER TUBING. Copper tubing is available in rigid and flexible types. Rigid type makes a neater installation and resists denting better. Flexible type can be bent around corners; requires fewer fittings; is often easier to install. Cut tubing with a fine tooth hack saw. Then remove burrs with reamer or round file. Remove loose particles inside.

Fittings are brass—available in common types and sizes. Adapter fittings, with one end threaded, permit easy joining of copper to steel pipe, and to valves with pipe thread tappings.

Sweat type joint is made by first cleaning and brightening end of tubing and inside of fitting with steel wool or fine sandpaper (Picture 40). A thin coat of non-acid flux is then applied. (Picture 41). Place fitting on pipe and wipe off any excess flux. Heat joint with blow torch until hot enough to melt solder (Picture 42). Then apply wire solder to face of fitting (or to small hole if provided in fitting) (Picture 43). Solder will melt and flow into fine crack between pipe and fitting, making a firm watertight joint. When enough solder has been used, it will form a line around face of fitting. Wipe off excess solder and allow joint to cool. An additional connection to the same fitting requires reheating. To avoid melting solder of previous joint, wrap that part with a wet cloth.

MEASURING PIPE FOR CUTTING. Measure distances very carefully before cutting any pipe. When cutting cast-iron pipe, allow extra length for distance spigot goes into hub. This is 2½ in. for 2-in. pipe; 2¾ in. for 3-in. pipe; 3 in. for 4-in. pipe.

With steel pipe, allow for threads that must screw into fittings at each end of pipe. To determine exact length for a connecting piece of steel pipe, measure distance between faces of fittings. Then for ⅜-, ½-, ¾- and 1-in. pipe sizes allow an extra ½ in. at *each end* of pipe for threads. For 1¼-, 1½-, and 2-in. pipe, allow ¾ in. at *each end* for threads. (Double these allowances for 2 ends.)

For example, if ¾-in. elbow (A, Picture 44) and ¾-in. tee (B) are 2 feet apart, cut pipe so its length will be 2 ft. plus ½ in. plus ½ in., or 2 ft. 1-in. total length.

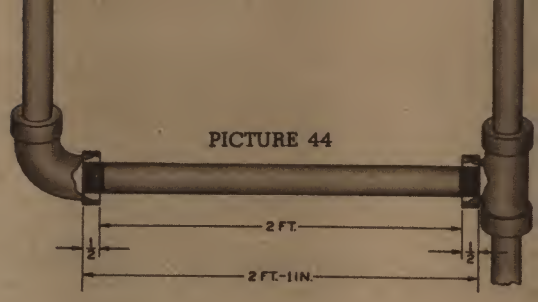
PIPE SUPPORTS AND HANGERS. It is important that all pipes be adequately supported to avoid pipe breakage, leaking joints, sagging and failure to maintain proper grade for drain lines. Various supports either commercial or home made can be used.

The vertical soil stack is supported primarily by stack base. Additional support can be furnished by pipe rests or wooden braces. Usually a brace is placed under hub of sanitary tee receiving closet bend and nailed firmly to joists (Picture 46).

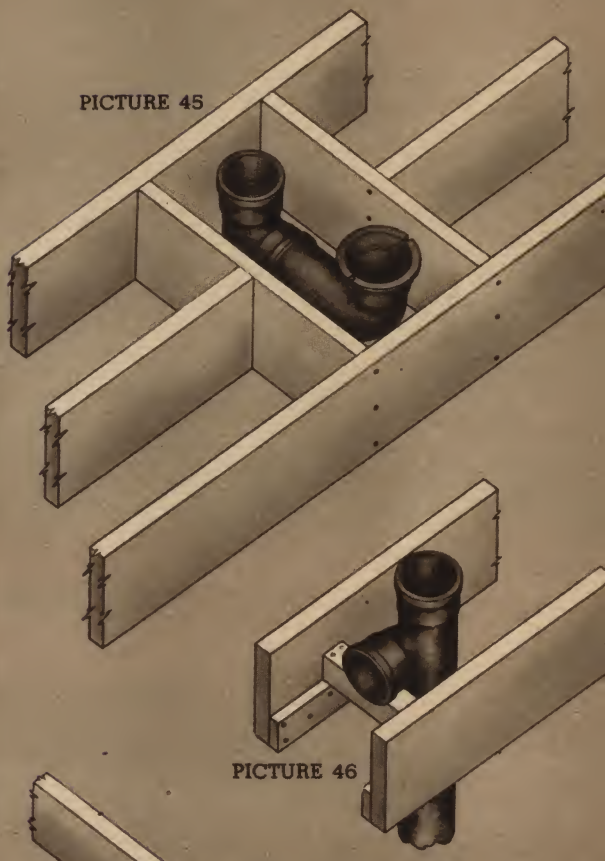
Support horizontal pipes with iron or wood hangers (Picture 47) or *trapezes* of metal or wood (Picture 48). Horizontal runs of soil pipe should be supported at about 5-ft. intervals; (near joints) steel pipe at 8- to 10-ft. intervals.

CUTTING JOISTS AND STUDS. Hold such cutting to a minimum as it weakens house structure. If a joist must be deeply notched or completely cut, as for closet bend running across joists, connect cut joists with headers (Picture 45) for reinforcement.

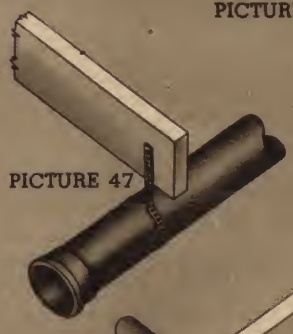
Where slight notching is necessary, members may be reinforced by nailing 2-by-4's at point of notching (Picture 49). Adding a wedge (Picture 50) will also add strength. For small pipe wood may sometimes be drilled (Picture 51).

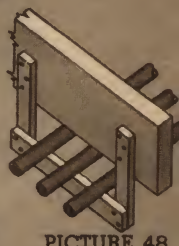


PICTURE 44


PICTURE 45

PICTURE 46


PICTURE 47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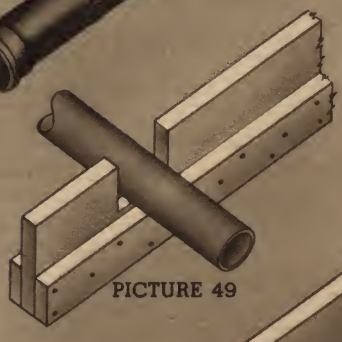
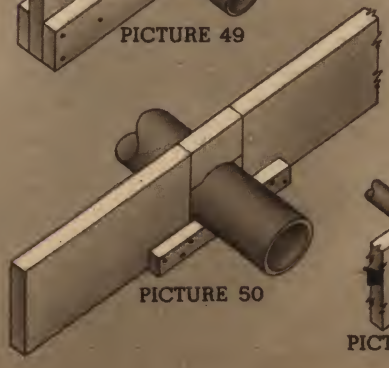
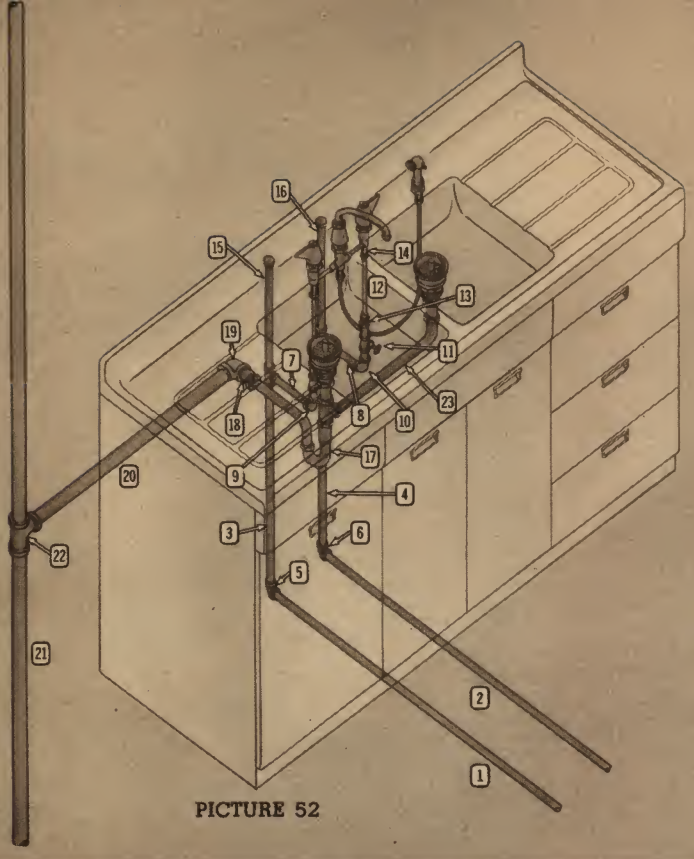
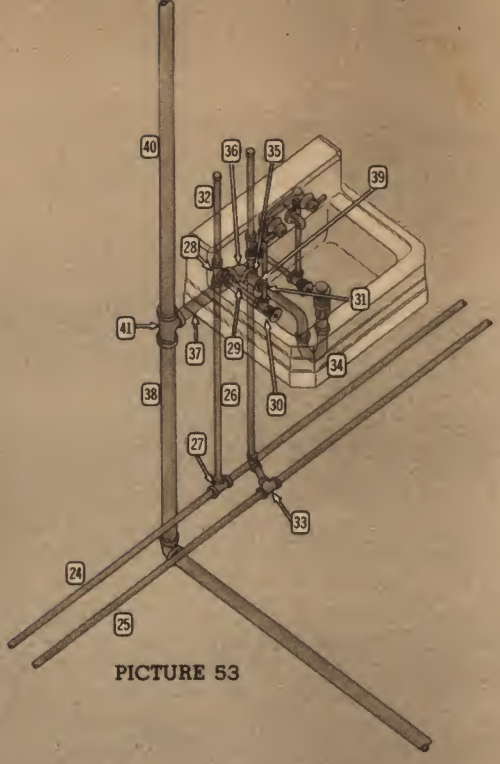

PICTURE 49


PICTURE 50


PICTURE 51



PICTURE 52



PICTURE 53

How to hook up fixtures for

These examples show in detail typical supply and waste connections for various fixtures. Actual location of pipes and stacks may vary according to individual requirements.

Kitchen sink (Picture 52) receives hot water through ½-in. basement main (1) and cold water through ½-in. main (2). Pipes (3) and (4) are ½-in. and run in wall behind sink. They are connected to basement mains by ½-in. elbows (5) and (6). Pipes (3) and (4) could, instead, be brought up through sink cabinet from floor (recommended with sink on outside wall in cold climate). See inset, Picture1, Page 4.

Supply pipes extend to ½-in. tees which divert water through ½-in. nipples (7) and (8) to ½-in. elbows (9) and (10). Coming up from elbow (10), cold water connection is made up of a ½-in. nipple, ½-in. shut-off valve (11), another ½-in. nipple and bendable sink supply pipe (12) with union coupling (13) for nipple connection. Top of supply is threaded inside and out for screwing to either ¼-in. faucet tailpiece (14) or ½-in. faucet shank. (Identical fittings are used between elbow (9) and hot water faucet.)

Air chambers (15) and (16) are ½-in. pipe with caps and extend 12 to 18 in. above tee connection. These air chambers are not required; their purpose is to prevent banging noises in pipes when faucets are quickly closed.

Sink wastes through P-type trap (17), nipple (18), elbow (19) and pipe (20)—joining waste stack (21) at tee (22). Trap, elbow and pipe are 1½-in. diam. Waste stack should be 1½- or 2-in. diam. Sink waste connector (23) is used with double basin sink to join both basin wastes to one trap (17). Connector may be cut to necessary length.

Piping arrangement may vary somewhat depending upon location of supply pipes and stack. Pipes may run outside instead of inside partition. In houses without basement supply mains may run horizontally in wall behind sink.

Pipes (24 and 25, Picture 53) are either basement mains (lavatory on first floor) or fixture branches (lavatory on second floor). Hot water rises to lavatory through ½-in. pipe (26) from tee (27). Tee is either ¾ by ½ in. or all ½ in. depending upon size of pipe (24).

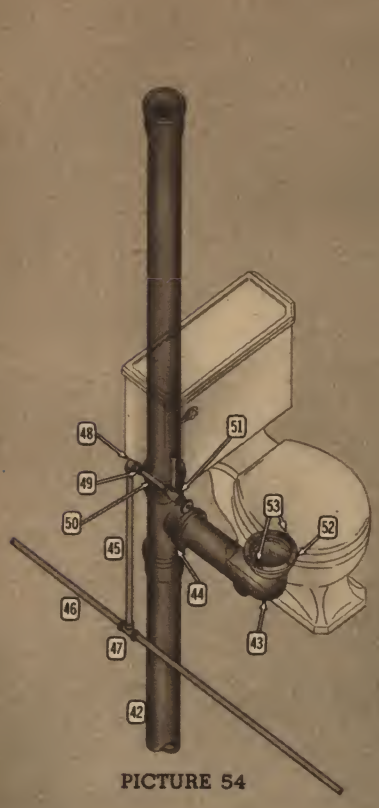
A ½- by ⅜-in. bushing is used to connect ½-in. tee (28) and ⅜-in. lavatory supply (29). Water then travels to stop valve (30) and up to faucet through pipe (31). Stop valve (30) is not required but is strongly recommended for quickly turning off water (if faucet trouble develops) without shutting off entire building. Air chamber (32) is recommended; if not desired, use ½-in. elbow in place of tee (28). Cold water supply takes off from tee (33) and is installed—using same kind of fittings—parallel to hot water.

Lavatory drains through 1¼-in. P-trap (34), 1½-in. nipple (35), 1½-in. elbow (36) and 1½-in. horizontal waste pipe (37) to vertical waste pipe (38). Nipple (35) extends about ½ in. through plaster to join trap. Tailpiece of 1¼-in. trap (as used for lavatory) slips into 1½-in. nipple. Watertight connection is made using slip joint nut (39) with friction ring and washer. No. (40) is vent pipe needed where vertical waste (38) is used. No. (41) is a 1½-in. drainage tee.

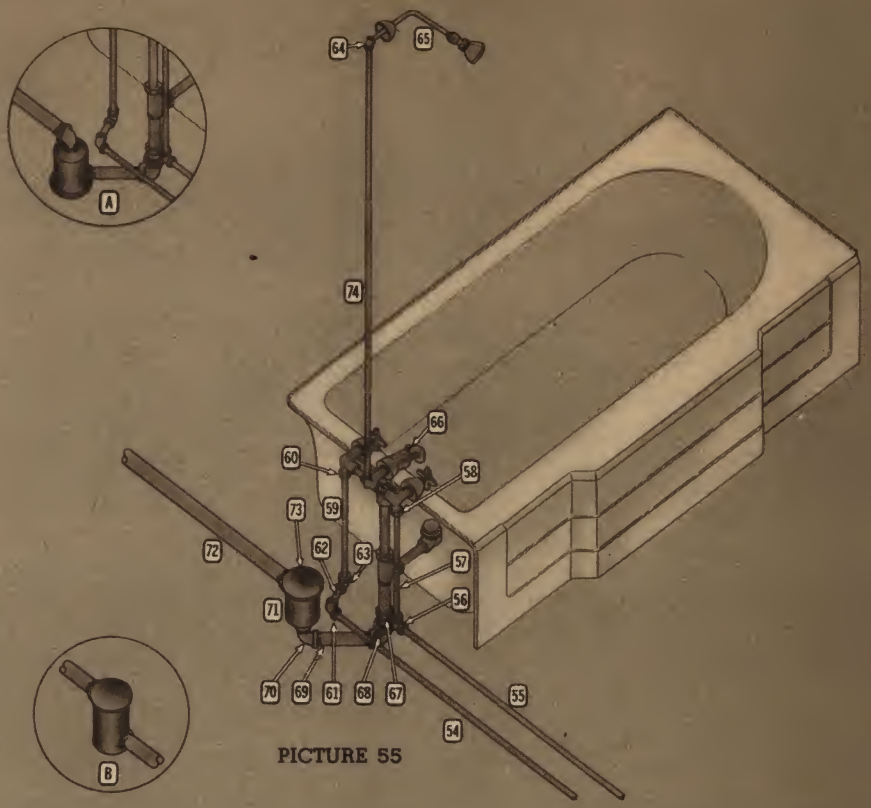
As with sink, lavatory hook-ups differ between installations. Often supply and waste pipes are run straight up from floor or horizontally within partitions.

Picture 54 shows closet connected to soil stack (42) through closet bend (43) and sanitary tee (44). Closet bend must be 4-in. diam. For 4-in. stack, use 4x4x4-in. sanitary tee (44). If stack is 3-in. use 3x3x4-in. tee.

Water supply pipe to closet tank may come up from floor directly under tank or project horizontally from wall riser



PICTURE 54



PICTURE 55

LONG, TROUBLE-FREE SERVICE

pipe as shown. In Picture 54, ½-in. pipe (45) receives water from cold water line (46). Connection is made at tee (47). Water rises to ½-in. elbow (48) into which a ½- by ⅜-in. bushing (49) is screwed to receive ⅜-in. closet supply pipe (50). The closet supply consists of nipple, stop valve (51) and riser pipe. Closet supply pipes are also available without stop valve. Valve is recommended, however, to permit turning off water if overflow, leak or other need for servicing develops.

To install closet, insert closet collar (52) over closet bend (43) in floor opening. Seal space between collar and bend with oakum and lead. Fit heads of brass closet bolts (53) in slots of collar so that threaded ends project up. Space bolts to fit rear holes of closet.

Turn closet over and put gasket around bowl outlet. Then to provide a watertight seal, spread closet setting compound generously around underside of closet where opening meets collar and on floor around outline of closet base. Closet may now be put in position by placing rear holes over bolts projecting from collar and fastening down with nuts. Fasten front of closet to floor by screwing closet screws through front holes in closet base and fitting with nuts. Porcelain caps, if provided, are set over nuts.

Waste and supply piping for built-in type bathtub are shown in Picture 55. All piping for this type tub—whether recessed or in corner—should be concealed in partition. It is desirable to provide easy access to this piping by installing a removable wall panel near the floor in the next room (or hall) at outlet end of tub. Connections should always be on an inside wall.

In new construction, built-in tub rests on rough sub floor with finished top floor set flush against its base. Back and end rims rest against wall studs. Old house requires cutting away plaster and lath below rims; also plaster, lath and part of floor must be cut at end of tub for pipes. Complete tub installation before finishing walls and floor. Support tub with horizontal 2x4 nailed to studs under back edge. Be sure tub is level. Wall finish (plaster, tile or other) will extend over tub flanges to seal out water.

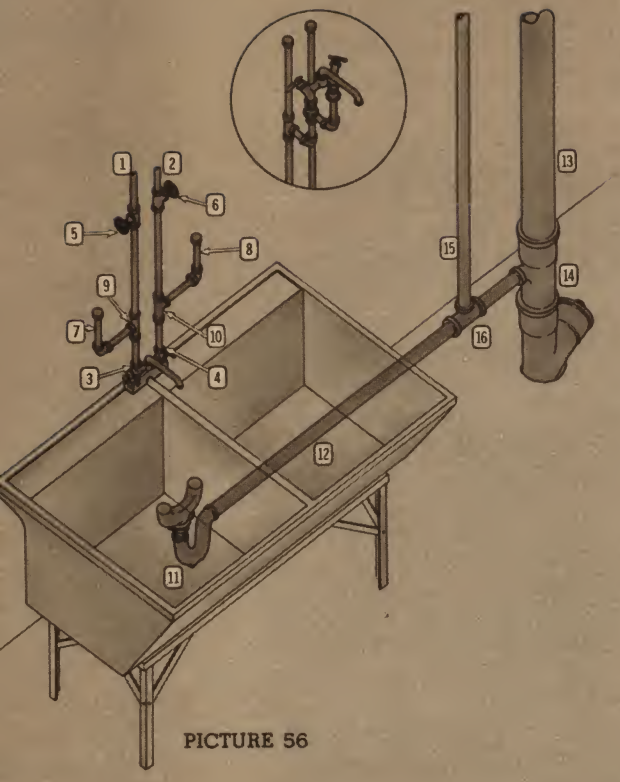
Fixture branches (54 and 55, Picture 55) are ½-in. diam. and supply hot and cold water to tub. Hot water flows through pipe (55) to ½-in. elbow (56) and up ½-in. supply pipe (57) to hot water faucet connection. Connection is made to ½-in. faucet tailpiece by union coupling (58).

In order properly to line up ½-in. cold water supply pipe (59) with faucet tailpiece (60), elbows (61) and (63) with nipple (62) are used. If shower is desired, screw ½-in. riser pipe (74) to opening behind spout of combination type fitting. Fit end of pipe with ½-in. elbow (64). Shower pipe with head (65) then screws into elbow.

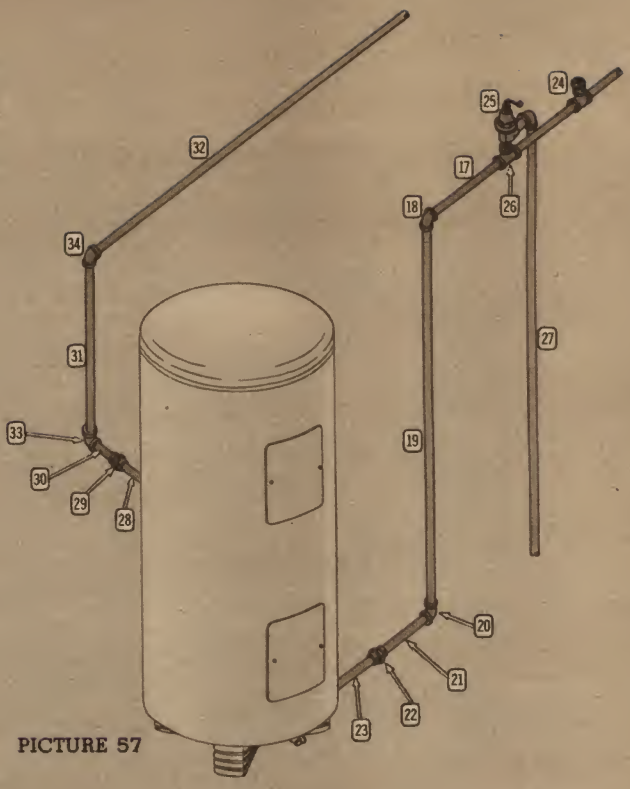
There are various shower hook-ups. Type shown, however, is easiest to install. Both shower and tub spout are controlled by single set of faucets with diverter (66) on spout.

Tailpiece of bathtub waste and overflow assembly is connected to short 1½-in. nipple by slip nut (67). Waste then flows through 1½-in. drainage elbow (68), pipe (69) and 1½-in. street elbow (70) to 4 by 5 in. drum trap (71). A 1½-in. waste line (72) then continues from trap.

Trap is mounted with cover up and flush with floor (as shown) if bathtub is on second floor, in an accessible place, so cover (73) may be removed to clean trap. For tub on first floor, trap is inverted (with cover down) so trap may be cleaned from basement (see inset A). Inset B shows a 4- by 8-in. drum trap with two side tappings; often used with upstairs bathtub, as it may be easier to connect.



PICTURE 56



PICTURE 57

CONNECTIONS FOR TUBS AND HEATERS.

Select location for laundry tub that most nearly meets these ideal conditions: (a) near water heater for short hot water line connection; (b) near soil or waste stack for short waste line run; (c) near window for best natural light. It is advisable also to have tub near a floor drain.

If laundry tub is in basement, water mains usually are near ceiling. Hot and cold water is brought down to faucets through ½-in. supply pipes (1 and 2, Picture 56). These pipes connect to ¾-in. mains with ¾- by ¾- by ½-in. tees. If mains are ½-in., use ½- by ½- by ½-in. tees.

Union couplings (3) and (4), parts of faucet shown; join supply pipes. Stop valves (5) and (6) shut off water to tub without cutting off other fixtures. Air chambers (7) and (8) are assembled with ½-in. nipples, elbows and caps; connect to supply pipes with ½-in. tees (9) and (10).

In house without basement, water mains often are run under floor to utility room. Supply pipes then rise to laundry tub from floor and join faucet having bottom or rear connections—see inset picture.

Wastes from tub drain into 1½-in. P-trap (11) and flow through 1½-in. waste pipe (12) to stack (13). If stack is 3- or 4-in. soil pipe, connect waste line to the 1½-in. tapping of a 3- or 4-in. tapped tee (14). If connecting to waste stack of 2-in. pipe, No. (14) is 2- by 2- by 1½-in. drainage tee. Use 1½-in. tee for 1½-in. stack.

Vent pipe (15) is necessary if any fixtures empty into stack at higher level. Vent connects to stack above point of highest fixture discharge connection. Use 1½-in. pipe and connect to drain (12) with 1½-in. tee (16).

Picture 57 shows typical plumbing connections to automatic water heater (electric type is shown). Supply pipe (17) extends from cold water main to elbow (18) which directs water through pipe (19) to elbow (20). Connection to ¾-in. inlet tapping of heater is made using pipes or nipples (21) and (23). Union (22) is needed to connect heater. Stop valve (24) in line (17) shuts off cold water supply when draining hot water system or disconnecting heater.

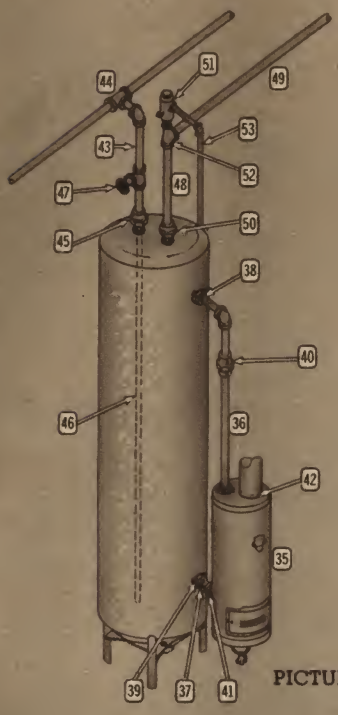
All supply pipes and fittings should be ¾-in. size. Cold water main should be ¾-in. as far as heater.

Always install safety relief valve. Choose from 2 types; check local code. Diaphragm pressure type (25) is installed in *cold water supply* as near tank as possible—ahead of any other valves in line. Valve has ½-in. threads and screws to side opening of ¾- by ¾- by ½-in. tee (26). If damaging pressure develops, valve discharges through ½-in. overflow pipe (27). Combination pressure-temperature type relief valve is installed in hot water line; Picture 58.

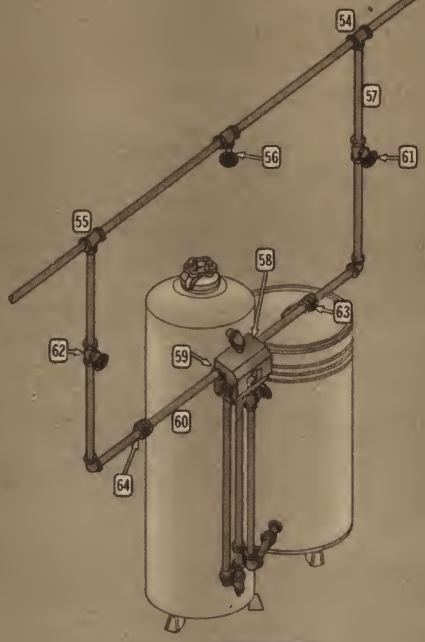
When a faucet is opened, hot water from heater travels through pipes or nipples (28) and (30)—connected by union (29)—and pipes (31) and (32) to hot water main. Outlet tapping of heater is ¾-in. pipe size. If ½-in. hot water main is desired, reduction can be made in pipe (31) or (32) by inserting a ¾- by ½-in. reducer or at heater tapping by using a ¾- by ½-in. bushing. Size of union (29) and elbows (33) and (34) depends upon pipe size.

Picture 58 shows a typical hook-up where a simple water heater or furnace or boiler is used to heat water for a separate storage tank (or "range boiler"). Water heater in hook-up shown may burn gas (pictured) or oil, kerosene or coal.

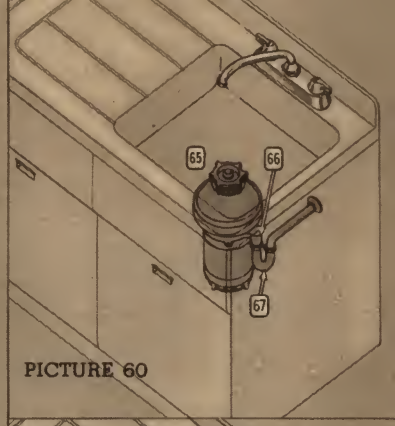
Heating of water creates a natural circulation. When water in heater (35) is heated, it rises in pipe (36) and enters top of storage tank. As hot water leaves heater, it is replaced through pipe (37) by an equal volume of cold water from bottom of tank. This circulation is continuous while heater is in operation.



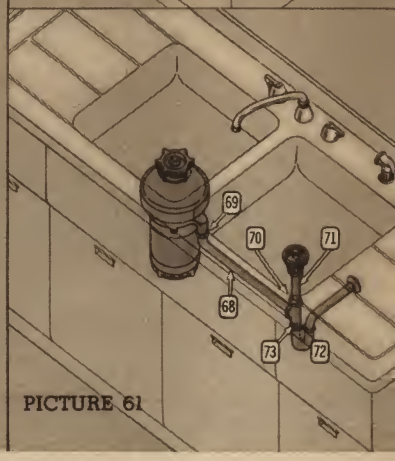
PICTURE 58



PICTURE 59



PICTURE 60



PICTURE 61

SOFTENERS AND GARBAGE DISPOSERS

Connecting pipes (36), (37) are at least ¾-in. diam. to fit ¾-in. tappings of heater. If tank tappings are for 1-in. pipe, insert a 1- by ¾-in. bushing (38, 39) in each tapping. (If heater tappings are for 1-in. pipe and 1-in. pipe is used, bushings are not needed.) Unions (40) and (41) complete connections.

All heaters (except electric) require a vent or smoke pipe running to house chimney or through roof. Attach at opening (42) on top of heater. Insulate where near wood.

Cold water supply (43) to tank is ¾-in. diam. and takes off from basement main at regular ¾-in. or ¾- by ½- by ¾-in. reducing tee (44). Supply connects to tank at 1-in. tapping with 1- by ½- by ¾-in. tank union (45). To avoid cooling hot water at top of tank, a ½-in. cold water tube (46), within tank, discharges incoming cold water near tank bottom. Tube screws to ½-in. tank union threads (45). Supply pipe should have shut-off valve (47) to use when draining tank and hot water pipes.

Hot water is drawn from top of tank through pipes (48) and (49). A 1- by ¾-in. tank union (50) is screwed into 1-in. tapping of tank to receive ¾-in. pipe (48).

Combination pressure-temperature safety relief valve (51) is installed near tank in hot water line. One of several installation methods is shown. Valve has ½-in. threads which can be screwed to tee (52). If pipe (49) is ¾-in. size, use a ¾- by ½- by ¾-in. tee; if pipe is ½-in., use a ¾- by ½- by ½-in. tee. Valve is threaded to receive a ⅜-in. overflow pipe (53).

If water is hard, supply hot water system with soft water by connecting a softener (Picture 59) to cold water main ahead of heater. Connect pipes for closets and garden hose (not requiring soft-water) ahead of softener to hold down softener load for less frequent regeneration.

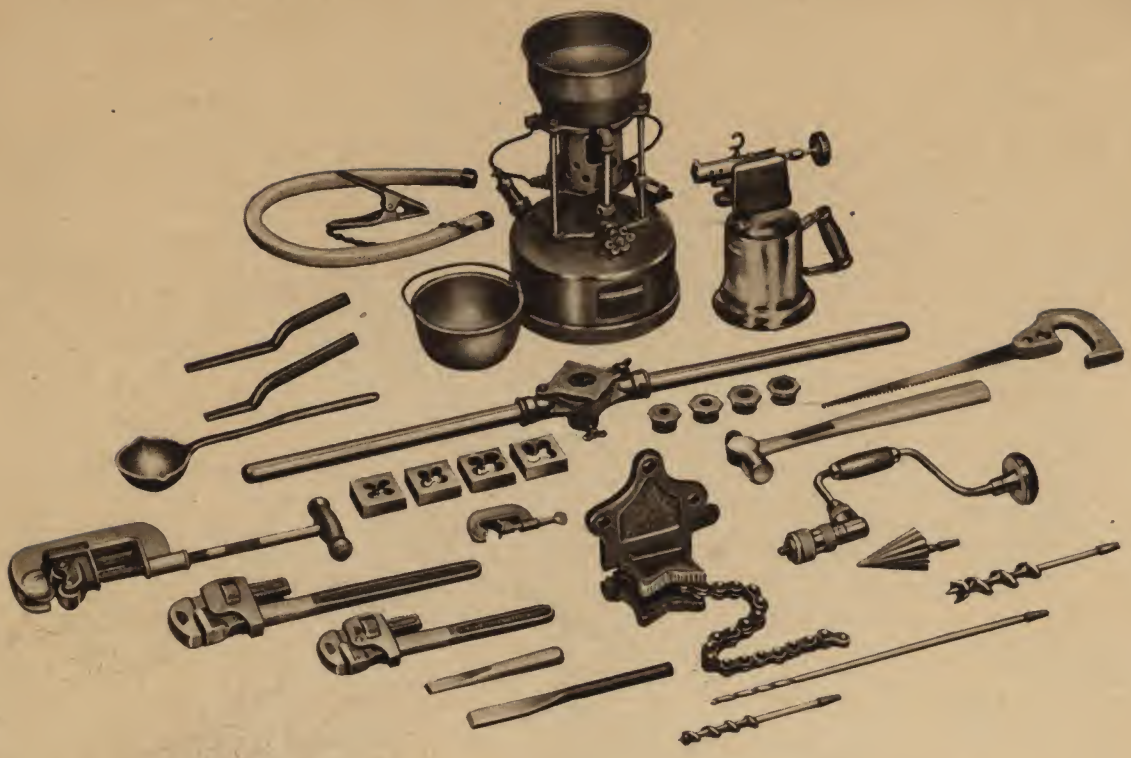
Softener is connected to cold water main at tees (54) and (55). Stop valve (56) should be in main between tees. When this valve is closed, water is diverted through line (57) to softener inlet (58). Treated water leaves softener through outlet (59) and travels through line (60) to water main connection at tee (55). All pipe, nipples, valves and fittings should be ¾-in. size.

Inlet and outlet pipes are fitted with shut-off valves (61) and (62) to cut off softener when regenerating. With valves (61) and (62) closed and valve (56) open, water will bypass softener through main. Unions (63) and (64) are needed to complete connections.

The electric garbage disposer (Pictures 60 and 61) takes the place of unsanitary garbage cans. Usual wastes such as bones, parings, fruit pits, paper napkins, etc. can be flushed down sink drain into disposer which quickly pulverizes these wastes for passing into drainage system. Disposer is easily connected to old or new sinks having usual 3½- or 4-in. drain openings.

Wards disposer can be used with either single- or double-basin sink. Picture 60 shows single-basin installation. Mouth (65) of disposer connects to waste opening in bottom of basin. Disposer empties through 1½-in. outlet (66) to which a 1½-in. sink trap (67) is attached. If necessary for lining up with present wall opening, trap can be lowered by inserting an extension with slip nut between disposer outlet and trap.

Picture 61 shows one method of hooking up disposer to double-basin sink. One end of waste connecting arm (68) screws to outlet of disposer with slip nut (69). Tee of waste connecting arm has slip nut (70) which joins to tailpiece (71) of sink waste. Trap (72) then is connected by slip nut (73) to tailpiece extending from bottom of tee.



HERE'S HOW WARDS HELP YOU SAVE

The cost of labor for installing a plumbing system may be as much as all the materials. This means you may save as much as half the total cost by installing your own system, with just a little assistance on a few operations. Whether you are modernizing your home, replacing obsolete equipment, or building new, Wards will help you in 4 important ways:

I. WARDS LEND YOU ALL THE TOOLS. No need to buy expensive special tools you may not use again. Wards lend to plumbing equipment customers all the special tools needed to install a plumbing system. There is no charge for tool use; only a deposit is required.

Order tool sets according to type of job. Set No. 81-2480 is for cutting and assembling steel pipe up to 1-in. diameter, and copper tubing. The following are included: heavy-duty pipe cutter, copper tubing cutter; blow torch; 14-in. stillson wrench; 18-in. stillson wrench; chain pipe vise; die-stock with cutting heads for threading ¼-, ⅜-, ½-, ¾- or 1-in. steel pipe; bit brace; 1-in. auger bit; ¼- by 18-in. feeler bit; pipe reamer; compass saw, rip chisel.

For steel pipe larger than 1 in., order Set No. 81-2481 which includes all the items in Set 81-2480 plus die-stock with cutting heads for 1¼-, 1½- and 2-in. pipe, and 24-in. stillson wrench.

To install 3- or 4-in. cast-iron soil pipe, request Set 81-2482, consisting of: gasoline plumber's furnace; melting pot; melting ladle; straight and offset calking irons; yarning iron; asbestos joint runner; cold chisel; ball pein hammer.

For the typical, complete modernization job including both water supply and waste systems, order both Set 81-2480 and Set 2481. See Wards General Catalog (or go to Wards Catalog Office) for amounts of deposits and other details about borrowing tools.

II. FREE ENGINEERING ADVICE. If you need additional information or advice, send complete details to Wards Engineering Service Department at your nearest Ward Mail Order House.

III. HIGH QUALITY FIXTURES AT LOWER PRICES. Wards sinks, lavatories, water closets, bathtubs and other fixtures are designed for beauty, utility and long service. All fixtures harmonize so that you can select groups to meet your own special needs and preferences from Wards Catalogs. All fixtures and plumbing supplies are fully guaranteed. Compare Wards low prices with others for similar high quality.

IV. CONVENIENT MONTHLY PAYMENT PLAN. All the plumbing fixtures and supplies needed for 10% down; the balance in monthly payments. No need to wait—to put off enjoying the convenience of modern plumbing until you have all the cash; no need to use savings. See Wards Large General Catalog for details.

Plumbing is not only a modern necessity; it is an investment that usually increases the value of a home more than the cost of the plumbing. A modern plumbing system provides safer, more sanitary living conditions. Its cost can be far less than the expense of illness caused by outmoded, unhealthful facilities.

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